Psychological Bulletin

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LEARNING TELEGRAPHIC CODE

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I. INTRODUCTION

The first studies of the learning of telegraphic code, those of Bryan and Harter (**4, 5**), are familiar to the majority of psychologists. They have been frequently mentioned even in elementary textbooks in psychology. Yet apparently none of the studies published since those of 1897 and 1899 have received attention from more than a very few. This is true probably for two reasons. First, only 6 of the other 19 published articles concerned with the subject are in English. Secondly, most of the articles are published in reports and journals available only in a few libraries in this country. The present war with the resulting demand for the training of telegraphers in large numbers has given immediate importance to the study of the problems involved in the learning of code. This fact plus the fact that previous studies of such problems are relatively inaccessible makes it seem desirable not only to present a review of such studies here, but also to review them in somewhat greater detail than would otherwise be necessary.

Two different codes are in common use. The International or Continental Morse Code is used for radiotelegraphic communication in all languages using a Latin alphabet. For other languages, such as Japanese and Egyptian, special codes have been developed. They, however, need not concern us here. The International Morse Code is also used for wire telegraphy in Europe; in the United States the American Morse Code is used in wire telegraphy.

The International Morse Code and the American Morse Code are similar in certain respects but differ in others. Both are made up of two kinds of elements which are customarily called *dots* and *dashes*. But the particular combinations of dots and dashes representing given letters in one code differ from the combinations of dots and dashes representing the same letters in the other code. Furthermore, in the use of the International Morse Code in radiotelegraphy, a dot is a tone of a particular frequency (usually between 500 and 1,000 c.p.s.) which lasts for a certain length of time, its absolute duration varying with the rate of transmission.

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Similarly, a dash is a tone of the same frequency but has a duration three times that of a dot. In comparison, in the use of the American Morse Code in wire telegraphy, a dot is an interval of silence whose beginning is indicated by the down-stroke of a telegraph sounder and whose end is indicated by the up-stroke of the sounder. A dash is an interval indicated in the same manner, but of longer duration. The operator who is doing the receiving must distinguish between the down-strokes and up-strokes of the sounder on the basis of difference in timbre.

Most of the studies to be reviewed here were concerned with the International Morse Code. In those few studies which dealt with the American Morse Code, specific mention will be made of the fact. Unless such mention is made, the reader may assume that the study being discussed was concerned with the International Morse Code.

Proficiency in the use of either code is ordinarily described in terms of the number of words per minute that an operator can transmit or receive. By definition five characters constitute a word. Thus, in order to compute the speed of transmission of a particular message, one merely counts the number of characters sent in one minute and then divides this number by five. The range of proficiency attained in the use of the International Morse Code is wide. It varies from the amateur standard of transmission and reception of meaningful material at 13 words per minute to the highest speed of reception on record, 75.2 words per minute. The minimum requirement for a first-class commercial license is the transmission and reception of meaningful material at 25 words per minute and of nonsense material at 20 words per minute.

It is to be remembered that the degree of proficiency indicated by any specified rate of receiving varies with the kind of material which was received at that rate. Recognition of this fact is found in the usual practice of distinguishing between the rate at which an operator receives meaningful material and the rate at which he receives nonsense material. However, it is apparent that the degree of proficiency indicated by a particular rate of receiving may also vary with the duration of the speed test and with the per cent of accuracy required. An operator of a given level of ability will be able to receive at a faster rate for two minutes than he will for ten minutes. His rate of receiving will be higher if only 90% rather than 100% accuracy is required. Perhaps somewhat less apparent is the fact that an operator will receive at a faster rate if the message contains predominantly characters short in duration than if it contains an equal frequency of all characters both long and short.

(The duration of one of the longest characters, zero, is 19 times that of the shortest character, the letter *E*.)

The following discussion will be divided into three parts. First, consideration will be given to those studies concerned with problems involved in learning to receive. Secondly, the studies dealing with problems arising in learning to send will be reviewed. Finally, attention will be directed to those studies concerned with the measurement of aptitude.

II. LEARNING TO RECEIVE

The Learning Curve

The pioneer studies of Bryan and Harter (4, 5) were primarily concerned with the determination and explanation of the form of the curve representing progress in learning to receive the American Morse Code. Their published curves are familiar to psychologists as the earliest and best-known examples of the occurrence of plateaus in learning curves. The earlier study (4) presents an analysis of the progress over a period of about nine months of two students learning the code in a Western Union office. At that time the minimum speed required of an operator was 14.4 words per minute. Just before reaching this required speed, the receiving curves of both students showed a period extending over several weeks during which no progress occurred. At the end of such plateaus, both students again showed sustained progress. To check the validity of these results, Bryan and Harter conducted a questionnaire survey among a large number of men who had learned the code and also among four schools in telegraphy. The replies which they obtained led them to believe that the results described above were typical.

In the second study (5), Bryan and Harter advanced the hypothesis that "learning to receive the telegraphic language consists in acquiring a hierarchy of psycho-physical habits." They suggested further that plateaus represent the period during which a transition is being made from one order to the next in such a hierarchy. According to this point of view, a student first learns to receive letters, then words, and then phrases or sentences. There is no plateau in the early part of the receiving curve because the student learns to receive letters and to receive words simultaneously. The plateaus found, so they thought, represent the transition from receiving words to receiving phrases. To verify this

hypothesis, over a period of about six months Bryan and Harter tested a subject each week in receiving letters which did not make words, words which did not make sentences, and connected discourse. The results obtained, they felt, support the interpretation that plateaus occur during the perfecting of lower-order habits.

Although the curves of Bryan and Harter have been repeatedly presented as representing the usual course of learning in telegraphy, it is very doubtful that they are typical. In a thorough study completed in 1918, but unfortunately never published, Rees Tulloss (23) obtained rather conclusive evidence that plateaus are not a necessary characteristic of curves representing the learning of code. In an analysis of the progress of four students of the American Morse Code in one school and of the progress of 22 students of the International Morse Code in two other schools, he did not obtain a single learning curve showing a plateau.

Since Tulloss is the only man who has studied the progress of students of both codes, it is of particular interest that results obtained for American Morse Code were essentially similar to those obtained for International Morse Code. It is also of interest that two men who had been proficient in the use of the American Morse Code learned the International Morse Code no faster than those who had not had such prior experience.

Failure to find plateaus in such a large number of curves would seem to question seriously the hypothesis of Bryan and Harter. It would seem that while plateaus may occur in individual cases they are not a necessary characteristic of telegraphic learning curves. As Tulloss pointed out, the suggestiveness of the questionnaire used by Bryan and Harter may have influenced the replies which they obtained in their survey. Because of this, the actual occurrence of the plateau phenomenon may not have been as frequent as their survey led them to believe.

The hypothesis of a hierarchy of habits would lead one to expect that an operator would be able to receive disconnected words only at a much slower rate than he could receive connected discourse. Further, since a still lower order of habits would be involved, one would expect that an operator would receive nonsense material at an even slower rate than he could receive disconnected words. This is essentially what Bryan and Harter (5) found in their study of one subject. However, in analyzing the progress of 19 men attaining speeds even higher than that attained by Bryan and Harter's subject, Tulloss (23) found markedly different results.

The men were tested weekly on their ability to receive each of the following four kinds of material: (1) sentences, (2) disconnected words, (3) nonsense material with each character occurring as frequently as it does in ordinary language, and (4) alphabetical code, that is, nonsense material with an equal frequency of all letters. The proficiency of the students in receiving the various kinds of materials varied as the order in which they are listed above, with the rate of receiving material composed of sentences being highest. But in contrast to what would be expected on the basis of the hypothesis of a hierarchy of habits, the differences in rates of receiving among the four kinds of materials were relatively small.

Even more striking is the case of one student reported by Tulloss, who was given practice only on nonsense material but who was tested regularly on both meaningful material and on alphabetical code. He was consistently able to receive alphabetical code at a higher rate of speed than that at which he could receive the meaningful material. Likewise, Biegel (2) describes two students who were allowed to practice only with nonsense material. Both of these men also were consistently able to receive nonsense material at a higher rate than that at which they could receive meaningful material. Thus, it appears that the hypothesis advanced by Bryan and Harter is not acceptable. It seems probable that the rate at which one can receive different kinds of material depends at least in part on the relative amounts of practice one has had in receiving such kinds of material.

Tulloss (23) obtained one result which is worthy of particular note in passing. He raised the following question. If, for example, a man makes five errors in receiving 85 characters per minute, at what rate can he receive without errors? In a study of four students receiving nonsense material, he found that if a student could receive perfectly a certain number of characters at a given speed, the errors he would make in receiving characters at a higher speed would on the average be equal to the difference between the higher speed and the speed at which he could receive perfectly. Thus, if a student made five errors in receiving 85 characters per minute, he would in general be able to receive perfectly at 80 characters or 16 words per minute. This he found to be true up to a limit of 25% errors and a 25% increase in sending speed.

Thurstone (20) was interested not in the form of the learning curve, but in the change in variability of proficiency among the members of a group in successive stages of learning. He analyzed the progress of 165 men over a period of 72 hours of practice. The median speed reached at the end of this time was six words per minute. He obtained two results of interest. First, he found that variability in degree of proficiency among

the men increased continually throughout the 72 hours. Secondly, he found that the distribution of proficiency scores remained symmetrical in spite of the continuous increase in variability.

Difficult Characters

It is a matter of common knowledge among instructors in telegraphy that students seldom make mistakes in receiving certain characters, but have considerable difficulty with others. A partial explanation of this may be found in the fact that the patterns of dots and dashes representing the various characters vary in complexity. Thus for example, an *E* is one dot, whereas a comma is dash-dash-dot-dot-dash-dash. It may be that such differences in complexity make certain characters inherently easy and others hard to learn. Supporting this suggestion is the comment of Koch (9) that if five or six of the so-called difficult characters are placed together at one point in the initial learning of the characters, a short but distinct plateau will occur in the curve representing progress in learning. This would indicate that such characters must be in some way inherently more difficult.

Tulloss (23), however, has shown that at least one other factor is probably of importance. In a tabulation of the errors which 19 students made on speed tests, he found that there were individual differences in the characters frequently missed. Nevertheless, he noted that there were certain letters, such as *Z*, *Q*, *J*, *X*, and others, on which all students seemed to have difficulty. He advanced the hypothesis that the characters with which the students had the most difficulty were those on which they had actually received the least practice. Ordinary magazine articles, such as are commonly used for practice material, contain some characters much less frequently than others. An analysis of samples of practice material carried out by Tulloss revealed that those characters previously found to be most difficult were actually those occurring least frequently in the practice material. That the relative frequency of occurrence of individual characters in practice material is important is also indicated by an experiment carried out by Biegel (2). He gave two students equal practice on all characters until they had attained speeds of about 18 words per minute. At this point he found no differences in difficulty among the various characters for the students.

Improvements in the Teaching of Receiving

In one of the oldest methods of teaching receiving, and one

which is still in common use, the student is first given a visual chart containing the letters and numerals and their corresponding patterns of dots and dashes. Using this chart, he memorizes the code. He is then given practice in receiving meaningful material. The speed of transmission is gradually increased from day to day until the required speed is attained.

Tulloss (23) suggested certain changes in this procedure. On the basis of his experiments, he concluded that operators learn to receive individual characters as wholes, but never words or phrases. The thing determining progress, he felt, was the development of responses to individual characters. In support of this point of view, he found in one experiment that there was a direct relation between a given student's speed of reaction to individual characters and his proficiency in receiving. Over a period of weeks actual measurements of the reaction times to individual characters of a number of students revealed that whereas the reaction times of students making good progress were reduced to about 400 sigma, poor students showed reaction times between 800 and 1000 sigma. To facilitate the development of unitary perceptions of individual characters, he suggested that students should avoid the use of visual symbols and the use of the terms *dot* and *dash* in initially learning the code. In addition, he suggested that nonsense rather than meaningful material should be used for practice for two reasons. First, such material would concentrate the attention of the student on individual characters rather than on words. Secondly, nonsense material which contains an equal frequency of all characters avoids giving an excessive amount of practice on some characters and too little practice on other characters.

A further characteristic of the older method is that the durations of the dots, dashes, and spaces change with the rate of sending. This practice is based on the international agreement that the elements of the International Morse Code should have the following relative length:

(1) A dot is of unit length.

(2) A dash is equal to three units.

(3) The space between the component parts of any character is equal to one unit.

(4) The space between any two characters is equal to three units.

(5) The space between any two words is equal to five units. (The U. S. Army and the U. S. Navy have adopted the use of an interword space equivalent to seven units rather than five.)

Thus, for example, in decreasing the rate of transmission from 16 to 7 words per minute, the durations of the dots, dashes, and spaces would all be increased proportionately.

The first suggestion that it would be desirable to maintain constant the duration of the dots, dashes, and spaces within characters throughout the learning process appeared in two bulletins published in 1917 and 1918. These bulletins were concerned with the training in radiotelegraphy of conscripted men and were issued by the Federal Board for Vocational Education (24, 25). Although no explanation was given, it was stated that from the beginning of learning, individual characters should be sent at the rate of 20 words per minute. Slower speeds should be obtained by increasing the spaces between letters and between words.

This recommendation next appeared in an article by Lipmann (13) in a manuscript prepared in 1920 but not published until 1928. He had recorded (12) the sending of an expert operator at 15 words per minute and at five words per minute and had found that the average duration of the dots, dashes, and spaces within characters was almost exactly the same at the two speeds. The operator decreased his rate of sending merely by increasing the intervals between characters and between words. This led Lipmann (13) to suggest, apparently independently, that the speed of transmission of individual characters should be held constant at about 20 words per minute during learning, and that only the duration of intervals between characters and between words should be varied.

Experimental support for this suggestion was presented in 1932 by Biegel (2). Working under a Gestalt orientation, he held that at high speeds each individual character has a distinctive Gestalt or rhythmic pattern. The expert operator perceives as unitary the patterns representing individual characters. Unfortunately, when dots, dashes, and spaces are all lengthened proportionately in sending at slower speeds, individual characters are no longer perceived as organized patterns, but are perceived analytically as so many dots and dashes. Biegel thought that this breakdown in organization occurred at about 16 words per minute. Thus, the older method of sending the characters initially at about six words per minute forces the student to learn the code analytically. Above a certain rate of transmission it is impossible to perceive the individual characters analytically. When the student reaches this point he must change his method of perception and learn to

perceive the characters as auditory temporal patterns. To avoid this difficulty Biegel contended that from the very beginning the student should be taught to perceive the characters as rhythmic patterns. This could be accomplished, he thought, by initially sending the individual characters at 20 words per minute. Messages, thus, would be sent at 6 words per minute by sending the individual characters at 20 words per minute and by greatly increasing the spaces between letters and between words. Because their use tends to foster analytic perception, visual symbols should be avoided. For the same reason the characters should not be referred to in terms of dots and dashes. To prevent the student from guessing at the message during the relatively long intervals existing between characters thus sent at slow speeds, only nonsense material should be used for practice.

Using the procedure just described, Biegel trained two students. One student reached the speed of 25 words per minute in 153 hours and the other in 176 hours. This Biegel compared to the progress of 41 students in the Post, Telephone, and Telegraph School in Amsterdam, Holland. There, the best student required 185 hours to reach 25 words per minute, the median student 297 hours, and the poorest student 405 hours. If Biegel's two students could be considered to be of average ability, then his method might be considered to be 44% more efficient than the older method. However, it is to be emphasized that these results are open to serious question, not only because Biegel used only two students, but also because his procedure differed in respect of other parameters in addition to the one supposedly being investigated. For example, the distribution of hours of practice differed markedly in the two groups. In addition, one group received group instruction, whereas the other received what was practically individual instruction.

Koch (9) agreed with Biegel that the perception of characters at high speeds is the perception of Gestalt patterns. However, two experiments which he performed seem to indicate that the breakdown in such patterns with a decrease in transmission speed comes not at 16 but at about 10 words per minute.

In one experiment he recorded the sending of four expert operators at a number of different speeds. These men had all been trained by the older method to maintain the relative durations of dots, dashes, and spaces as defined above. Yet the records showed that only at transmission speeds of ten words per minute and above did their sending actually correspond approximately to the proportions so defined. Below ten words per minute, the men all increased disproportionately the spaces between characters and between words.

In a second experiment he used the same four expert operators as subjects. Nonsense messages consisting of 30 characters each were auto-

matically transmitted at speeds varying from 5 to 20 words per minute.
Amazingly, at 5 words per minute the operators copied only 5 to 8 of the
30 characters correctly. As the speed of sending was increased the ac-
curacy of the operators in receiving increased. At all speeds between 10
and 20 words per minute they were able to copy the messages perfectly.
In a second part of the same experiment, similar messages were also sent
at speeds varying from 5 to 20 words per minute. However, this time the
length of the intervals between characters and between words was
doubled, the duration of dots, dashes, and spaces within characters being
correspondingly shortened. With this change reception was much im-
proved at slow speeds. Koch interpreted the results of these two experi-
ments as indicating that characters at high speeds are necessarily per-
ceived as organized patterns and that when the speed of transmission is
decreased, the point at which such patterns break down is about 10 words
per minute.

Koch also agreed with Biegel that the use of visual symbols
and the use of the terms *dot* and *dash* should be avoided, that non-
sense material should be used for practice, and that students should
be taught from the beginning to perceive the characters as organ-
ized patterns. However, he disagreed with Biegel at two points.

First, he contended that individual characters should be sent
initially at 12 words per minute rather than at 20 words per minute.
He felt that the Gestalt nature of the characters did not change
essentially between 12 and 20 words per minute, and that, in ad-
dition, it was somewhat easier for the students initially to perceive
the characters at 12 words per minute.

Secondly and more important, he criticized the procedure pro-
posed by Biegel of initially sending the characters at high speeds,
but with intervals between characters of such duration that the
message as a whole is sent at about 6 words per minute. The dif-
ficulty with this method, he felt, was that in the relatively long
intervals between characters the students tend to analyze the
character which they have just received. To overcome this dif-
ficulty, Koch suggested a different procedure. Instead of sending
messages at about 6 words per minute in the early stages of learn-
ing, not only the individual characters but also the messages in
their entirety should be sent from the beginning at about 12 words
per minute. By the older methods the entire alphabet is first
learned, and then the speed of receiving messages is slowly in-
creased. By Koch's method the student is first taught to distin-
guish two characters at 12 words per minute. When he can copy
with 90% accuracy messages containing only these two characters,
a new character is added. In the same manner additional charac-

ters are taught one at a time until the entire alphabet is learned. At that point when the student knows the alphabet, he is also able to receive at 12 words per minute.

Using the procedure just described, Koch taught an unspecified number of students to receive. At the end of 27 half-hour practice periods they could receive messages containing the 26 letters of the alphabet at the rate of 12 words per minute. This seems quite impressive. Unfortunately, however, there was no control group, and in comparing the performance of this group with that of other groups it must be remembered that there may be a number of other uncontrolled parameters—*e.g.*, distribution of practice periods, number of characters learned, personality of the instructor, etc.

In an attempt to emphasize further the organization of the individual characters, Koch constructed an automatic transmitter by means of which he could send dots with a tone of one frequency and dashes with a tone of a higher frequency. He felt that it might be advantageous if in the earlier stages of learning students could use the added cue of pitch discrimination. He proposed that as learning proceeded the frequency of the dots and the frequency of the dashes should be brought closer and closer together until they become identical. With this change in procedure, he taught a second group of an unspecified number of students. This group attained in 24 half-hours the standard of performance which the first group had attained in 27 half-hours, a difference which, however, probably can not be regarded as significant.

The possibility should be mentioned here that the sending of dots of a tone of one frequency and dashes of a tone of another frequency in order to permit the use of cues based on pitch discrimination may be superfluous. It has been shown (17, pp. 100–105) that for tones of very short durations perceived pitch is a function of duration. Thus, it seems possible that even when, as is usual, dots and dashes are tones of the same frequency, the operator may actually use pitch discrimination in receiving code. Supporting this suggestion is the fact that ability to learn code is correlated with performance on tests of pitch discrimination (11, 19).

Taylor (**19**) carried out three experiments concerned with possible improvements in the teaching of receiving. A control class of 13 men and three experimental classes, containing 15, 13, and 17 men respectively, were taught one hour a day, five days a week. At the end of 40 hours, the 46 students completing the course had attained speeds in receiving meaningful material ranging from 8 to 20 words per minute with a mean speed of 13 words per minute. The conditions and procedures used in teaching the control class differed only in respect of the variable being studied in each case from those used in teaching the experimental classes.

The first of the three experiments was concerned with the speed

of transmission of the individual characters. In the control class the individual characters were from the beginning transmitted at a speed of 18 words per minute and the messages were sent initially at slow speeds. In the experimental class the individual characters were from the beginning of learning transmitted at the same speed as the messages and the messages were sent initially at slow speeds. Contrary to what would be expected on the basis of the work of Lipmann (13), Biegel (2), and Koch (9), no significant difference was found between the speed of learning of the control class and that of the experimental class.

Taylor's second experiment was concerned with a comparison of the efficiency of two different orders of initially teaching the characters. Ordinarily, the characters are not taught one by one, nor are they commonly taught all at once. The usual procedure is to present the characters to the students in groups, each successive group of characters being mastered by the students before an additional group is presented. One common method is to teach together those characters which are most similar. This method, however, has been criticized. Characters which are most similar are those which are most difficult to discriminate. Therefore, it has been contended, teaching similar characters together makes the first stages in learning unduly difficult and confuses the student. Accordingly, some have argued that dissimilar rather than similar characters should be taught together.

To test the validity of this contention, an experiment was performed. The common method of teaching similar characters together was used in the control class, whereas in the experimental class dissimilar characters were taught together. No significant difference was found between the two classes in respect of speed of learning.

Taylor's third experiment involved a comparison of the relative efficiency of two different methods of reinforcement used in teaching the code. The procedure commonly used in teaching students to receive involves what might be called delayed reinforcement. Ordinarily, the instructor transmits practice material for a certain length of time. This period may be 2 to 4 minutes in the early stages and 15 minutes or longer in the late stages of learning. Then he stops and reads the material transmitted so that each student can check his own errors. Thus, the "reward" for correct responses and the "punishment" for incorrect responses is delayed until the instructor reads the correct message.

Many experiments have shown that immediate reinforcement produces faster learning than does delayed reinforcement. Accordingly, Taylor (19) developed a procedure for teaching code by immediate rather than by delayed reinforcement. During the early stages of learning, the instructor transmits the characters one at a time. The students are instructed to respond orally to the transmission of each character with the name of the character sent. Thus, not only is each man forced to make a response, but he immediately becomes aware of the correct response. In the later stages of learning, sentences are sent one at a time. Following the transmission of each single sentence, the message sent is read aloud.

Taylor (19) used the method of immediate reinforcement just described in teaching the control class and the usual method of delayed reinforcement in teaching the experimental class. Surprisingly, no significant difference was found between the speeds with which the two classes learned to receive.

Distribution of Practice

The length and distribution of practice periods would seem to be a consideration of major importance in the teaching of code. This problem, however, has thus far received no systematic experimental treatment. At present, in schools of telegraphy, students are frequently required to practice as much as three or four hours a day. That such a requirement is in the interests of efficiency may be questioned. Biegel (2) reported that he began teaching two students two hours each day, one hour before lunch and one hour after lunch. Because he felt that the second hour of practice accomplished little, he soon reduced the time spent to one hour a day. Koch (9) has suggested that the optimum length of practice periods is a half-hour, and that if possible the students should be given a half-hour of practice in the morning and a half-hour in the evening. These suggestions, however, await experimental test.

III. Learning to Send

The Learning Curve

Students ordinarily make much faster progress in learning to send than they do in learning to receive. For this reason the problems involved in teaching sending have appeared to be of less immediate practical importance. Probably because of this, the learn-

ing of sending has received much less attention than the learning of receiving.

Swift (**18**) in a study of the learning curve of one subject thought that he found evidence of the occurrence of plateaus. The experiments of Bryan and Harter (**4**) and of Tulloss (**23**), however, have shown that the typical curve representing progress in learning to send is of the usual negatively-accelerated form and displays no marked plateaus. It is to be noted that while in the first months of learning the sending curve rises more rapidly than the receiving curve, the receiving curve eventually crosses the sending curve. Expert operators can receive more rapidly than they can send.

Individual Differences

Although all operators are trained to attempt to send the dots, dashes, and spaces in the proportions as described above, actually most operators deviate to some extent from what might be called such ideal sending. Bryan and Harter (**4**) analyzed records of the sending of 16 operators by measuring the average durations of dots, dashes, and spaces. This analysis showed that the deviations of the sending of individual operators from ideal sending is not random. Rather, each individual shows certain consistent kinds and amounts of deviation. These consistencies persist although the rate of sending is varied and might be said to constitute an individual style of sending. Bryan and Harter found that it was actually possible to identify a particular unknown sample of sending simply by measuring the average durations of dots, dashes, and spaces and by comparing these measurements with comparable measurements for each of the operators who might have sent it.

Improvements in the Teaching of Sending

The chief problem in the teaching of sending is to teach the student to manipulate the key in such a way that the dots, dashes, and spaces produced all have the proper duration. This problem would seem to be of more importance than the attention given it would indicate.

Biegel (**3**) suggested that an automatic transmitter be connected in series with an electromagnet. The electromagnet would be so placed that when activated it would close a telegraph key. Thus, a message sent perfectly by the automatic transmitter would produce in the key all the movements ordinarily used in sending

the message manually. In the first stage of the learning, the student merely places his fingers on the key and feels the correct movements. Next, he attempts to send the message at the same time as the automatic transmitter. If he starts to make errors, his movements are corrected by the action of the electromagnet. In the third stage, an ordinary key is placed beside the special key. The student operating the ordinary key attempts to follow the movements of the special key. After 30 hours of practice in using this technique, one student was able to send eight words per minute with an almost perfect rhythm. This, however, hardly can be regarded as an adequate test of the method.

Fujimoto (7) raised the question of whether a specially designed silent key would lead to greater efficiency in sending than does the use of the ordinary type of key. Tests carried out on two operators (presumably using the Japanese code) showed that elimination of key sounds tends to give rise to disturbance of work rhythms and makes errors in sending more numerous. The subject using a silent key feels uncertain because of the lack of auditory cues. It is to be noted that the results of this experiment are directly applicable only to wire telegraphy where headphones are not used. In radiotelegraphy auditory cues are normally provided not by the sound of the key but by the production of the transmitted signal in the sender's own phones.

Taylor (19) devised a special tape for use in an automatic transmitter. The tape was so constructed that it would send a character three times followed by an eight-second pause, then send another character three times followed by another eight-second pause, and so on. The instructor, in using the tape in teaching sending, directed the students to attempt during the pause following each character to send the character just as they had heard it.

A common procedure in teaching sending is to have the students work in pairs, one man sending and the other receiving. To determine whether the method using the special tape was more efficient than this common procedure, Taylor (19) taught one group of men by one method and another group by the other method. Objective measures of the quality of sending taken before and after the experimental training period indicated that there was no difference in the efficiency of the two methods. These measurements also showed that, although students are given regular sending practice and although they appear to be able to send to and receive from each other proficiently, the quality of their sending may actually be relatively poor. Hence, as Taylor pointed out, the common belief that more difficult problems arise in teaching students

to receive than in teaching them to send may actually be incorrect and may arise from the fact that, while objective measures of the quality of receiving are easily obtained, similar measures of the quality of sending are rarely available.

Telegrapher's Cramp

Occasionally operators develop what has been called telegrapher's cramp. Although they may previously have been expert operators, with the onset of the disease they find it difficult if not impossible to operate a telegraph key. Smith, Culpin, and Farmer (16) carried out a thorough investigation of 41 telegraphers suffering from cramp and of 46 control cases. Both groups were given tests on a Kraepelin ergograph, a McDougall-Schuster dotting machine, and a piezograph (a telegraph key attached to a pressure-recording instrument). The tests showed that as a group the subjects with cramp were more susceptible to fatigue, less accurate in the use of the dotting machine, and used greater pressure in operating a telegraph key. However, there was considerable overlapping in the scores of the two groups, and many of the subjects with cramp made better scores than some of the control subjects.

Dr. Culpin made a medical examination of each of the cases with cramp and of each of the control cases. The variety of symptoms displayed by the cases with cramp was striking. Some experienced difficulty only in sending certain combinations of dots and dashes, while in other cases the disability was so marked that the arm affected could not even be used in such gross movements as digging with a shovel. Among the cases, onset of the difficulty occurred after 2 to 20 years of service. On the average the time of onset was earlier among the women than among the men.

The most important result of the medical examination was the discovery that 31 of the 41 cases with cramp suffered with symptoms apart from cramp that would lead to a diagnosis of minor mental disturbance or psychoneurosis. The symptoms included were those of anxiety, obsessions, and hysteria. Of the other ten subjects with cramp, one had an organic lesion and the remaining nine had no discoverable symptoms. Six of these nine subjects had no difficulty on the tests described above. Of the 46 control subjects, 15 had psychoneurotic symptoms of varying degree. These results seem to indicate that telegrapher's cramp is probably functional rather than organic in origin.

As Smith, Culpin, and Farmer point out, the following conditions of

the work of a telegrapher make it particularly exacting: (1) Speed and accuracy are required. (2) The receiving operator is always a potential critic. (3) The operator must frequently work in the presence of others. (4) Sending involves rapid delicate muscular movements easily disturbed by anxiety. (5) There is a rigid objective standard of attainment. (6) Characters once transmitted can not be recalled. Such conditions of work may well aggravate pre-existing psychoneurotic tendencies and lead to the development of telegrapher's cramp.

IV. MEASUREMENT OF APTITUDE

Men vary greatly in their ability to learn code, and a number of different attempts have been made to measure this ability. Thus far, primary emphasis has been placed on aptitude for learning to receive, the assumption being that if a man can learn to receive well, he can also learn to send. The practical importance of the measurement of aptitude is indicated by the fact that from 30 to 60% of unselected men beginning the study of the code in commercial and military schools fail to become proficient operators.

Mental Tests and Code Aptitude

During the first World War, Thurstone (**21, 22**) gave seven different tests of intelligence to 165 conscripted men. In 100 hours of practice this group of men attained an average receiving speed of 6.4 words per minute. The tests given together with the correlations obtained between scores on such tests and achievement in code were as follows: Opposites Test, .42; Analogies Test, .29; Gordon Directions Test, .27; Trabue Completion Test, .21; Spelling Test, .18; Arithmetic Test, .08; Sentence Test, .09. In addition, he gave a test of rhythm which showed a correlation of .48 with code achievement. This test was composed of 35 different patterns of dots and dashes sent at ten words per minute. The students were required simply to indicate the patterns perceived by recording the appropriate dots and dashes. The multiple correlation between code achievement and the five mental tests showing the highest correlation with code achievement was .53, not significantly higher than the correlation between code achievement and the test of rhythm alone.

Further study of the 165 men revealed that for this group correlation between achievement in code and amount of previous schooling was .00. The correlation between the age of the students and code achievement was −.09. No relation was discovered between the occupation of the student prior to conscription and his

progress in code. On the basis of all these results, Thurstone concluded that ability in telegraphy is probably a special ability.

Taylor (**19**) gave the Wells Revised Alpha Examination Form 7 to 59 men who in 40 hours of practice attained speeds ranging from 3 to 20 words per minute. The correlations obtained between the several tests and achievement in code were as follows: Total Alpha Score, .50; sum of scores on mathematical tests, .39; sum of scores on verbal tests, .42; Addition Test, .40; Arithmetic Problems Test, .15; Common Sense Test, .27; Same-Opposite Test, .38; Mixed Sentences Test, .22; Numerical Relations Test, .38; Word Relations Test, .38; Directions Test, .46.

Scholastic achievement scores were available for 52 of the 59 men studied by Taylor (**19**). The correlation between such achievement scores and achievement in code was found to be .22 and not significant at the 10% level as indicated by the *t*-test.

It is to be noted that the 59 men studied by Taylor represented a narrow range of intelligence, all of them being in the upper six per cent of the general population in this respect. Nevertheless, the results he obtained are of the same order as those obtained by Thurstone on a larger and more representative group.

The Analytic Approach

Lipmann (**12, 13**) pointed out that there were two possible approaches to the study of code aptitude, the analytic approach and the molar (*komplexe*) approach. In using the analytic approach, one first attempts to determine by analysis all the different special abilities involved in code aptitude. Next, one measures each special ability separately. Finally, one combines by some method all the part scores into one total score representing code aptitude. In using the molar approach, one does not attempt to analyze code aptitude into special abilities. Instead, one devises a test which involves the same abilities as code aptitude. By means of such a test one score is obtained which is taken to represent code aptitude.

Lipmann's own work (**13**) represents the most thorough analytic study made. On the basis of his own observations, he concluded that the following special abilities were all important in the work of an operator: (1) auditory sensitivity, especially between 500 and 1,000 c.p.s., (2) differential pitch sensitivity, (3) absolute tonal memory, (4) differential loudness sensitivity, (5) learning ability, (6) ability to recognize the same signal with variations in pitch and rhythm, (7) ability to distinguish very similar rhythms, (8) ability to receive each character as a character and to avoid tendency to fill in characters not clearly perceived, (9) speed of

reaction to characters, (10) ability to write down one character while listening for another, (11) ability to distinguish individual rhythmic patterns from the larger rhythmic whole, (12) ability to adjust to changes in working speed, (13) relative insensitiveness to distractions, and (14) ability to abstract signals from a background of constant or periodically recurring disturbance. For each of these special abilities Lipmann suggested certain testing procedures. However, apparently no validation of such procedures was ever carried out.

In the actual selection of personnel, Riefert (15) used, together with Lipmann's complex test to be described under the next section, tests of auditory sensitivity, of differential loudness sensitivity, and of memory for timbre. Unfortunately, he has reported no figures on the results obtained.

Klutke (8) used a battery of five tests. In the first of these tests, a narrative consisting of about 400 common German words was read at a constant rate. The task of the students was to write down the first letter of each word. The second test was like the first except that the words composing the sentences in the narrative were presented in a mixed-up order. In a third test, a series of proper names, the initial letters of which combined to make a meaningful sentence, was read at a constant rate. The task of the students was simply to listen, remembering each initial letter, and finally putting them all together to make the correct sentence. The fourth test used was a rhythm test similar to the one devised by Thurstone. The fifth was a test of differential pitch sensitivity. By use of the test battery, Klutke was able to predict correctly the 3 best students and the 15 poorest students among a total of 71 students tested.

Lahy (11) investigated the possibility of using tests for musical ability as prognostic of code achievement. To about 100 students in a radiotelegraphic school who had been previously selected on the basis of general scholastic ability, he gave four of the tests from the earlier form of the Seashore Tests of Musical Talent, repeating each test once. Correlations between code achievement and each of the double-length tests given were as follows: Pitch, .44; Rhythm, .45, Time, .22, and Loudness, .02.

Taylor (19) gave to 59 men all of the tests from Series B of the revised form of the Seashore Tests of Musical Talents. The correlations found between achievement in code and each of the tests given were as follows: Pitch, .56; Loudness, .33; Rhythm, .55; Time, .64; Timbre, .25; Tonal Memory, .56. He also gave three tests of auditory function devised by Karlin to 27 of the 59 men.

The correlations between such tests and code achievement were as follows: Rapid Spelling, .35; Haphazard Speech, .42; Singing, .38.

Taylor (**19**) gave still another test of auditory function, the Signal Corps Code Aptitude Test, to the 59 men whose progress he studied. This test is essentially a test of rhythmic perception and consists of 78 pairs of patterns of dots and dashes. The task of the individual taking the test is to record whether the two patterns making up each pair are alike or different. Although the test is widely used, men who have used it have reported informally that it is low both in reliability and validity and that certain of the items included in it are non-discriminating. In confirmation of these informal reports, Taylor found the test to have a reliability coefficient of .86 and a validity coefficient of .52.

Taylor (**19**) obtained scores for 32 of the 59 men on two tests involving speed of reaction. One was a controlled-association test and the other a digit-cancellation test. In both cases, a correlation of .45 was found between achievement on the test and achievement in code. A digit-symbol learning test given to the same 32 men failed to show a significant correlation with code achievement.

The Molar Approach

Lipmann (**12**) was the first to suggest that the progress of students over a period of months could be predicted on the basis of the speed with which they initially learned a particular number of characters. To 71 subjects he gave a certain amount of practice in learning five characters (k, m, r, s, v). He then gave them several one-minute receiving tests in which the duration of the individual characters was held constant (dot equal to .07 second) but the speed of transmission was varied from two to seven words per minute. The frequency of the transmission tone was 1000 c.p.s. Distracting tones of varying intensity and of frequencies between 600 and 900 c.p.s. were introduced during the tests in which the transmission rate was between four and seven words per minute. Lipmann computed percentile norms based on the 71 men tested and suggested that any one in the lowest 30% should be dropped. No report of a validation of the test is given. Rieffert (**15**) has reported using the test, but he also failed to report any measure of its validity.

Biegel (**1**) has used a test differing essentially from that of Lipmann in that it involves no prior learning period. In the first part of the test, only three characters are used. The students do not re-

cord the actual names of these characters, but designate them only as *1*, *2*, or *3*. Individual characters are sent at 20 words per minute.

The design of Biegel's test is rather elaborate. Six series of ten characters and two series of 30 characters are sent with one second pauses between the individual characters. This procedure is repeated with the exception that pauses of only 5/6 of a second are used. Then three series of ten characters and one series of 30 characters are sent with 4/6 second pauses separating the individual characters. This procedure is repeated once with 3/6 second pauses and once with 2/6 second pauses. The effect of shortening the duration of the intervening pauses is of course to increase the speed of sending, the range of speeds represented here being about 8 to 18 words per minute.

In the second part of the test only two characters are used. These two characters are "mirror images" of each other (*e.g.*, *F* and *L*, dot-dot-dash-dot and dot-dash-dot-dot). Three series of ten characters were sent with one second pauses between the individual characters. This procedure was repeated successively with 5/6, 4/6, 3/6 and 2/6 second pauses. The entire test procedure was repeated three times to increase the reliability and to allow for practice effect. The results showed that the test series with one second and 5/6 second pauses were non-discriminating and might well be dropped.

Biegel gave this test to three different classes in the Post, Telephone and Telegraph School in Amsterdam. The classes were composed of 17, 21, and 18 students respectively. On the basis of the results he listed in rank order the students of each class. In the first class he set the criterion score arbitrarily at 78% correct so that 40% of the students received a prognosis of "good" and 60% of "poor." Use of the same criterion score in the second class gave 57% a prognosis of "good" and 43% of "poor." For the third class the criterion score was arbitrarily set at 72% so that 40% received a prognosis of "good" and 60% of "poor." Of the 56 students 34% were actually successful and 66% failed. Of the 27 who had been given a prognosis of "good" by the above procedure, 16 were successful and 11 failed. Of the 29 receiving a prognosis of "poor," 26 actually failed and 3 were successful. The prognosis thus was incorrect for 14 out of 56 students. The question may be raised as to whether it would not have been more valid to use the same criterion score for all three classes. On the basis of these results the test was adopted for use in personnel selection by Post, Telephone and Telegraph.

It should be noted that the 56 students to whom Biegel's test was given had been previously selected from among about 200 candidates on the basis of their scholastic record and a half hour interview. In spite of such prior selection 66% of them failed. This makes it appear extremely doubtful that either the knowledge of previous school record or the half hour interview was of any value in this particular instance for the selection of men for training.

Although he was not directly concerned with the measurement of aptitude, Koch's (9) method of teaching the code was such that he could observe the speed with which individual students learned the first few characters. On the basis of such observation he concluded that students who in the first two half-hour practice periods did not learn to receive four characters at 12 words per minute never were able to learn the code. He concluded further that if one observes progress during four half-hour practice periods, one can not only pick out the inapt, but one can also pick out those who will do very well and those who will be only average students.

Taylor (19), following the suggestion of Lipmann and Koch that achievement in code can be predicted on the basis of the speed of initial learning, constructed the Initial Learning Test. The test was designed to provide one measure of the speed with which students learn the first eight characters presented to them. As a part of the test, the students were given a half hour of practice under controlled conditions in learning eight characters previously unknown to them. Then a 100-item test lasting about 20 minutes was given to determine how well each student had learned the characters. The entire Initial Learning Test, including the instructions, the practice material, and the test itself, was presented by means of phonographic recordings.

When given the test during their first hour of practice, 59 men made scores ranging from 12 to 100 with a mean of 68.7 and a standard deviation of 25.2. The results obtained by Taylor indicate that the test is adequate both in respect of reliability and in respect of validity for use in the selection of personnel, the coefficient of reliability being .97 and the coefficient of validity .73.

Of the 59 men to whom the test was given, 9 were judged to be inapt on the basis of their performance on the test. On the basis of actual achievement in learning code, 9 men were found to be inapt. Of the 9 men judged inapt on the basis of the Initial Learning Test, 7 were actually inapt. In other words, 2 students judged inapt were actually apt, and 2 judged apt were actually inapt. Thus, predictions made on the basis of the test would have been correct for 55 out of the 59 men or 93% of the students.

Similarly, the best among the 59 students could be picked out on the basis of their test performance. The 6 best all made scores of 94 or above on the Initial Learning Test. Of the 14 best, 10 made scores of 90 or above, and the other 4 made scores above 65.

Thus, the Initial Learning Test seems to be the most promising

test yet developed* for use in the selection of men for training in code.

German Military Psychology

For the sake of completeness attention should be called to the work of three German military psychologists, Dietsch (6), Kreipe (10), and Mierke (14). Their studies were based only on personal observation and although they disagreed with previous writers at certain points, they presented no experimental evidence to support their contentions. However, certain of their suggestions are worthy of experimental test.

According to Dietsch (6) three factors are of importance in telegraphic aptitude: Empathic ability (*einfühlende Hingabemöglichkeit*), auditory ability, and intellectual apprehension. Disagreeing with all previous writers, Dietsch argued that tests should be discarded and that observational techniques should be used for the investigation of aptitude. Such techniques should be used in the examination of each candidate to determine: (1) Whether auditory or visual orientation is predominant, (2) whether susceptibility to auditory perception is free or willfully inhibited, (3) whether auditory reception is sustained even at high speeds, (4) whether assurance is shown in receiving rhythmical patterns, (5) whether received rhythmical patterns are perceived as organized, (6) whether the perception of rhythmical patterns is immediate or is mediated by intervening mental processes, and (7) whether the candidate is conscientious, reliable, and interested in the work.

Kreipe (10) attacked the hypothesis that measurements of differential sensitivity for pitch, for loudness, for timbre, and for duration will be correlated with achievement in code. He argued that all normal people have much greater sensitivity in each of these respects than is required in receiving code. However, the one ability which he thought to be important was the ability to distinguish similar auditory temporal patterns. Although he makes no reference to the Signal Corps Code Aptitude Test, the test which he proposed be constructed to measure the ability in question was very similar to it.

Strangely enough, Mierke (14) disagreed sharply with the suggestion that rhythmic ability is related to achievement in learning to receive. He pointed out that the code consists of long and short sounds which are irregular in their recurrence. Because of this, he argued, the code is arhythmic, and rhythmic ability has nothing in common with the learning of the code.

* In the latter part of 1942 the National Defense Research Committee established a project to develop a code aptitude test and to deal with other problems involved in training operators. The project, with headquarters in Chicago, is under the direction of Dr. Albert K. Kurtz. He is assisted by Dr. Harold Seashore and Dr. John Willits.

Mierke (**14**) stressed the importance of characterological factors, temperamental factors, and intelligence. In addition to possessing the necessary amount of intelligence, an operator should be careful, thorough, self-confident, reliable, and conscientious. Furthermore, he should have a temperament adapted to telegraphic work. Mierke thought that men with extreme or bizarre temperaments, including manic, neurasthenic, indolent, or meditative persons would not make good operators.

V. Summary

Problems involved in the learning of telegraphic code may be divided into three groups, those concerned with learning to receive, those concerned with learning to send and those concerned with the measurement of aptitude.

Although Bryan and Harter thought that plateaus typically occurred in curves representing the learning of receiving, experimental evidence obtained by Tulloss indicates that the occurrence of such plateaus is the exception rather than the rule. The fact that some characters tend to be more difficult to receive than others may be due in part to their inherent complexity and in part to the fact that such characters occur relatively infrequently in meaningful material and hence receive an inadequate amount of practice.

Tulloss, Biegel and Koch have all recommended that in teaching receiving the use of visual symbols should be avoided, that individual characters should not be referred to in terms of their component dots and dashes, and that nonsense rather than meaningful material should be used for practice. Lipmann and Biegel suggested that from the beginning of learning individual characters should be sent at about 20 words per minute. Koch contended that learning should begin with messages sent at 12 words per minute and containing only two characters, additional characters being added one at a time.

Taylor, however, in a carefully controlled experiment found that whether the individual characters were sent initially at a high speed or at relatively slow speeds made no difference in the speed with which men learned to receive. In two other experiments, he found that it made no difference in the speed of learning (1) whether similar or dissimilar characters were taught together during the initial learning period, or (2) whether immediate or delayed reinforcement was used in teaching the men to receive.

The typical curve representing progress in learning to send is of the usual negatively-accelerated form. Different operators

show consistent individualistic deviations from ideal sending such that each operator's sending may be identified on the basis of his individual style. Biegel suggested that a special key operated by an electromagnet be used to teach sending, but the use of such a key has not been adequately tested.

Taylor devised a special tape for use in an automatic transmitter. The tape was so constructed that each character was sent perfectly followed by a pause during which the students could attempt to imitate the character sent. Taylor, however, found that the use of the tape in teaching sending produced no more efficient results than the usual method of having the students practice by sending to each other.

Smith, Culpin, and Farmer carried out an investigation of 46 telegraphers suffering from cramp and of 46 control cases. The results which they obtained showed that as a group the operators with cramp were more susceptible to fatigue, less accurate in the use of a dotting machine, and used greater pressure in operating a telegraph key. However, there was considerable overlapping in each of these three respects between the operators with cramp and the operators in the control group. A medical examination revealed that 31 of the 41 cases with cramp suffered with symptoms apart from cramp that would lead to a diagnosis of minor mental disturbance. Only 15 of the 46 control subjects showed such symptoms. These results led to the conclusion that telegrapher's cramp is probably functional rather than organic in origin.

Thurstone gave seven different intelligence tests to 165 men and found correlations between such tests and code achievement ranging from .08 to .42. His results also indicated that achievement in code is not correlated with the age, amount of previous education or prior vocation of the students.

Taylor found a correlation of .50 between the achievement of 59 men in code and their performance on the Wells Revised Alpha Examination Form 7. The correlation between such achievement and the sum of the scores on the individual mathematical tests was about equal to that between such achievement and the sum of the scores on the individual verbal tests. He found no significant correlation between the scholastic achievement of 52 men and their achievement in code.

Lipmann listed 14 different special abilities which he thought to be involved in the learning of code. However, he presented no evidence adequate to support his suggestions. Klutke constructed a

battery of five tests which he used with some success to predict achievement in code.

Results obtained by Lahy showed that performance on the Seashore tests of pitch and rhythm is significantly correlated with code achievement. Similarly, Taylor found correlations of the order of .56 between such achievement and the Seashore tests of pitch, rhythm, time, and tonal memory.

Although the Signal Corps Code Aptitude Test is widely used, men who have used it report informally that it is low both in reliability and validity. In confirmation of these informal reports, Taylor found the test to have a reliability coefficient of .86 and a validity coefficient of .52.

Biegel has devised a test which measures a student's ability to distinguish characters without prior learning. Results obtained in using it indicate that it may be of some value for use in predicting achievement in code.

Taylor, following the suggestion of Lipmann and Koch that achievement in code could be predicted on the basis of speed of initial learning, constructed the Initial Learning Test. This test, designed to measure the speed with which students learn the first eight characters presented to them, seems to be the most promising test yet developed for use in the selection of men for training in code. When given to 59 men, it was found to have a coefficient of reliability of .97 and a coefficient of validity of .73.

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CONTENT OF THE FIRST COURSE IN PSYCHOLOGY

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In Wolfle's recent survey of the literature on the first course in psychology (10), the following statements occur: "The many elementary texts constitute one of the most easily available sources for the beginner to use in deciding upon the content of his course. . . . Outlines of carefully worked out courses have been published by Dashiell, Dockeray . . . " (10, p. 697).

These sources are valuable in suggesting to the instructor possible content for his course. As detailed descriptions of what is actually taught, they are quite inadequate. Analyses of the content of elementary textbooks (1, 2) might show what is taught if there were some assurance that instructors followed faithfully the textbooks they used. If instructors deviate appreciably from assigned textbooks—in order of topics treated, in interpretations of experimental data, in point of view, in proportional emphasis on the various topics, even in inclusion and omission of topics—such analyses become inadequate in proportion to the amount of deviation.

Published outlines of courses as actually taught are more promising, provided that they represent realities and not just hopes. Some of those cited by Wolfle are now outmoded, and others are too sketchy to be very revelatory.

The present paper exhibits a new approach to the problem of describing the content of the first course in psychology. It asks: Is not the content of the course what the student is expected to know of it? And are not those expectations embodied in the examinations he must take? Certainly, the level-headed student, who is an operationalist in this respect, knows that nothing in the course need concern him no matter how much zeal the instructor manifests over it, unless it can be translated into an examination question which he must answer true or false.

Whether that attitude is justified or not, it suggests a possibility for the investigator. May not a representative picture of the first course be obtained through an analysis of the examinations given in such a course? For the value it may have to those who wish to evaluate psychological offerings, the following results, obtained by analyzing final examinations of twenty-seven Pacific Coast institutions, are presented.

Source of Data. Requests were sent May, 1941, and again May, 1942, for "copies of the final examinations you have given your students in elementary general psychology the past year or two." The results, thus, represent normal, peacetime conditions. As Table I shows, the state universities of the three Pacific Coast

TABLE I
INSTITUTIONS REPRESENTED

	State Univ.	State Colleges	Private Univ. & Colleges	Denomi- national Colleges	Public Junior Colleges	Total
No. of requests sent	4	5	10	4	17	40
No. of responses	3	4*	7	1	12	27
%	75	80	70	25	71	67.5
No. of exams. tabulated	3[a]	3[b]	7[c]	1[d]	13#[e]	27
% of total	11.1	11.1	26	3.7	48.1	100

[a] California, Oregon, and Washington.
[b] Fresno, San Diego, and San Jose.
[c] College of the Pacific, Mills College, Occidental, Pomona College, Scripps, Southern California, Stanford.
[d] University of San Francisco.
[e] Bakersfield, Compton, Glendale, Long Beach, Los Angeles City College, Modesto, Pomona Junior College, Sacramento, San Bernardino, Santa Ana, Santa Monica, Santa Rosa, Ventura.
* Including Chico State College, which does not give a final examination in psychology.
# Including Compton Junior College.

states are represented. In addition, seven California private universities and colleges, large and small, are represented. Of these, two are women's colleges, and one is a men's college. Thirteen junior colleges which give the elementary psychology course are represented. Three state colleges, which prepare many students for teaching, are included. A denominational college (Catholic) is included to round out the picture.

Distribution of Specific Items. The total number of true-false, multiple choice, and other type questions in the twenty seven examinations was 5306, distributed as follows: 600 in the state universities, 550 in the state colleges, 1489 in the private universities and colleges, 30 in the denominational college, and 2637 in the junior colleges. Of this number, 180 questions were unclassifiable because of ambiguity. The remainder, 5126, were distributed among specific topics as tabulated in Table II.

TABLE II

DISTRIBUTION OF QUESTIONS AMONG SPECIFIC TOPICS

Topic	Number	%
1. learning, memory......................................	460	8.99
2. abnormal psychology, mental hygiene, conflicts, adjustment...	450	8.78
3. sensation...	397	7.71
4. emotion..	366	7.15
5. statistics, individual differences, tests and measurements	362	7.07
6. intelligence..	338	6.60
7. perception, attention, observation.....................	293	5.72
8. history of psychology, contemporary psychology, names and dates...	245	4.77
9. thinking...	245	4.77
10. motivation...	243	4.75
11. heredity, environment, maturation.....................	228	4.44
12. motor responses, reaction time, skills.................	190	3.71
13. social psychology: crime, war, propaganda, race prejudice, labor warfare, suggestibility, hypnotism, public opinion	186	3.64
14. nervous system......................................	178	3.46
15. glands..	158	3.08
16. personality: personal relations, marriage, friendship, abilities..	149	2.92
17. industrial psychology, business psychology, personnel, morale, work efficiency, vocational guidance........	118	2.30
18. philosophy of mind: definition of psychology, schools of psychology, psychology in relation to other sciences..	98	1.91
19. imagination, imagery.................................	94	1.83
20. scientific method, methodology........................	88	1.72
21. educational psychology...............................	71	1.38
22. child psychology, adolescence.........................	65	1.27
23. comparative psychology, animal psychology.............	45	.88
24. experimental psychology: apparatus, procedures........	42	.82
25. esthetics..	12	.23
26. evolution..	5	.10

The topic appearing with greatest frequency is learning. The five next most frequent topics are, in order, abnormal psychology, sensation, emotion, statistics, and intelligence. The topic which appears least frequently is evolution. The five next infrequent topics, in order, are esthetics, experimental psychology, comparative psychology, child psychology, and educational psychology.

Evidently, then, the standard topics still lead psychological offerings. There is, in addition, an emphasis on abnormal psychology, especially as it relates to mental hygiene and the elimination of personality conflicts. Evolution and esthetics are considered infrequently as are also the fields of specialized interest: animal psychology, child psychology, experimental psychology, and educational psychology. The topic of the nervous system, a bone of contention in the recent discussions, is halfway down the list, occurring with moderate frequency.

Distribution among General Categories: Theoretical vs. *Practical.*
It is not sufficient to know *what* specific topics are discussed in the
first course: we need to know *how* they are treated. With respect to
"learning," *e.g.*: are theories discussed, or is the emphasis on prac-
tical techniques? Is the topic dealt with to a great extent in neuro-
logical terms (neural passages, synapse, conditioning) or in terms of
"insight"? Are references mainly to experiments with animals or
to experiments with humans?

Hence, as the items were classified with respect to specific
categories, they were at the same time classified with respect to
general categories.

The first of these is relevant to the question, Should the first
course be scientific in tenor and logical in organization, or should it
be adapted to the interests of the student?

Wolfle (**10**, p. 688) believes that the major objective of the first course
should be "to teach the facts and principles of psychology." Hence, he
concludes, "the mere fact that students find a topic interesting is never
justification for including it in the course" (p. 695). Pratt fears that
psychology is today losing character because of "the substitution of sales
appeal for scientific adequacy and impartiality in the selection of content
for textbooks" (**5**, p. 366). He doubts the wisdom of orienting a course
around the "felt needs" and "interests" of students, since, he feels, the
existence of a "felt need" does not guarantee that its satisfaction will be
beneficial to the individual. Moreover, a course organized around stu-
dents' interests, which are frequently "capricious and accidental," tends
to repel the really serious and able student, who forms a "low opinion of
the integrity of psychology as a science and turns to other fields for sober,
scientific work" (p. 369). Similarly, Ewert objects that Vaughan's use
of humor in his *General Psychology* is undignified. In fact, he adds, "We
have no conclusive evidence for the value of humor in pedagogy" (**3**,
p. 174). The fear of these critics that the scientific standing of psychology
will be impaired by attempts to make it interesting and practical dupli-
cates a similar fear which hindered the development of applied psychology
in the early years of this century. Hollingworth refers to "those days
when applied psychologists were pariahs whom the anointed could
scarcely tolerate in the temple" and when "applications" of psychology
to any field beyond education were considered "unclean" (**4**, pp. 307, 308).

The opposed point of view is defended by Schoen, who says, "Psy-
chology should be the most vital course in the college curriculum. . . .
Our pride should not be so much that we are teaching psychology as a
science, but, rather, that we are teaching psychology as life" (**9**, p. 595).
He believes the course should help the individual in the business of living.
In 1926 he wrote thus, and his statements proved a harbinger of a new
trend. Writing in 1939, Emme reported that "the prevailing trend (in
elementary textbooks) is in the direction of adapting the material to the
present needs and interests of students" (**1**, p. 293). Ewert, too, reports:

"If we are to compare general psychology textbooks of today with those
of from ten to twenty years ago, we note an undeniable trend toward
. . . . popularization" (3, p. 173).

In the present investigation, items were divided into those of
practical value and those of theoretical value. An example of an
item of theoretical value is:

Cannon's theory of emotion assumes that emotion depends on (1)
thalamic control; (2) peripheral responses; (3) sensations or feelings;
(4) visceral changes; (5) postural alterations. .

An example in the same field of an item of practical value is:

Childish fears are almost invariably outgrown.

An item was classified as theoretical if its main function ap-
peared to be to promote an understanding of human nature, ir-
respective of the probable usefulness of that understanding. Such
items emphasize the significant, fundamental facts of systematic
importance. Cannon's theory of emotions, *e.g.*, helps us to under-
stand the physiological locus of emotions, but M. C. Jones's experi-
ments on unconditioning children's fears suggest a solution of a
practical problem. Practical purposes which items sought to serve
included making students better learners ("To study efficiently a
person must be relaxed"), better thinkers ("A syllogism is invalid
if its conclusion is false"), and better parents ("A child who re-
ceives early training in walking will always retain an advantage
over children his own age in this skill").

Items from the various types of institutions were classified
separately, to make comparison possible.

As the results given in Table III show, the junior colleges are
especially responsive to the increasing demand that psychological
offerings be oriented toward practical needs and interests. Practi-
cal items occur twice as frequently as theoretical items in the junior
college examinations. The state universities and state colleges
continue to emphasize material of theoretical interest primarily,
the proportion in the former case being three to one.

No doubt, the task of preparing students for advanced work in
psychology is a differentiating factor here, since presumably the
universities and colleges concern themselves considerably with
that task while the junior colleges give it relatively little attention.

Speculative vs. *Introspective* vs. *Experimental.* Since those who
object to orienting psychology around practical values do so for
fear its scientific rigor will be impaired, it is desirable to consider
the sources of the items found in the examinations. Are they the

TABLE III

CLASSIFICATION OF EXAMINATION ITEMS
BY VARIOUS CATEGORIES*

	State Univ.	State Coll.	Private Univ. & Coll.	Denomi-national Colleges†	Public Junior Coll.	Total
Theoretical	74.5	54.5	49.8	80.0	34.5	46.0
Practical	25.5	45.5	50.2	20.0	65.5	54.0
Speculative	31.0	17.6	14.1	86.2	8.9	14.2
Introspective	8.5	1.9	7.9	10.3	9.0	8.0
Experimental	60.5	80.5	78.0	3.5	82.1	77.8
Biology	7.7	8.6	6.6	3.3	8.0	7.7
Philosophy	4.6	2.6	2.9	63.4	3.1	3.6
Psychology	84.2	83.1	86.1	33.3	84.2	84.2
Others	3.5	5.7	4.4	0.0	4.7	4.5
Individual	61.5	33.6	52.2	50.0	44.0	46.5
Social	38.5	66.4	47.8	50.0	56.0	53.5
Terminology	11.7	14.9	12.8	6.7	12.2	12.5

* All figures are percentages.
† Only one institution.

results of experimentation and observation, do they derive from introspection, or are they speculative in nature?

An example of an introspective item is:

The negative after-image of yellow is blue.

An example of a speculative (philosophical, derived through reason, dialectical) item is:

A science seeks general laws; therefore psychology can not be a science since it studies the individual.

Items expressing psychological theories which extrapolate far beyond experimental or introspective data were also classified as speculative. *E.g.*, "Self-love is one of the earlier stages in the growth of the sexual emotion" will be recognized as a Freudian speculation. The various theories of emotion and of color must also be classified as speculative in origin, although, to be sure, they rest to an extent on an experimental basis. The examination from the one Catholic institution contained many questions on mind as substance, immortality, the origin and evolution of mind, mechanism *vs.* vitalism, and the like. These are obviously speculative, philosophical questions.

The next panel of Table III contains the data on the source of items.

The results show that all types of institutions recognize the

importance of grounding psychological generalizations on experimental foundations, except where parochial interests maintain a speculative orientation.

It is of interest that in the junior colleges, which emphasize practicality, experimental items, too, lead by far. Thus, it is demonstrated that it is possible to maintain scientific rigor of presentation and at the same time orient material around vital needs. Consider, *e.g.*, the following item:

In studying new material, it is better to study intensively each new part as it comes than to skim superficially over the whole.

It fills a need which students feel for guidance on efficient study habits; yet it also represents "sober, scientific work," based upon many rigorous experiments.

Biology vs. *Philosophy* vs. *Psychology* vs. *Other Disciplines.* For a long time, says Pressey, psychology sought for scientific standing by emphasizing its affiliation with biology, neurology, and physiology (6, p. 393). Today, as Emme reports, "there is less emphasis being given to the physiological backgrounds" (1, p. 293). Psychology can stand on its own feet by concerning itself with specifically psychological material and yet be scientific as well.

To what extent do psychology examinations test for specifically psychological material? Do they still rely on biology? *E.g.:*

Two individuals derived from the same fertilized ovum have the same heredity.
Without cortin, premature death occurs.

Or philosophy?

All any study needs to become a science is to make systematic generalizations based on careful observations.

Or even physics?

Fabrics dyed in red, orange, or yellow absorb more heat than fabrics dyed in other colors.

In general, items of a biological nature come from neurology ("dendrite," "synapse," "thalamus," etc.), the physiology of the endocrine glands, and genetics ("siblings," "identical twins"). Items of a philosophical nature mostly concern methodology and the nature of scientific method. Items from physics concern the action of light rays when refracted by the lens of the eye and the physical characteristics of sound waves and light waves. In some instances many items from sociology and economics are found: *e.g.*, the average age at marriage, incidence of feeblemindedness,

birth rates among different groups of the population, average in-
comes, and the like.

The next panel of Table III contains the data on the fields of
study to which the items belong.

It appears that although almost 8% of psychological items are
still drawn from biology, on the whole current courses in psychol-
ogy preserve their scientific character without borrowing to any
embarrassing extent from the other sciences or from philosophy.

The Isolated Individual vs. *Social Orientation.* To what extent
are psychologists concerning themselves with social problems?
Do they concern themselves with perception, thinking, learning,
etc. as individual responses exclusively, or do they emphasize the
social aspects of these responses? Do they attempt to bring psycho-
logical facts to bear on social problems: crime, war, poverty, in-
dustrial conflict, morale, propaganda, and race prejudice? Text-
books like those of Ruch (8) and Pressey, Janney, and Kuhlen (7)
contain much material drawn from the social sciences. Pressey be-
lieves that psychology is "faced with one of the most critical choices
in its history" (6, p. 393): namely, as he puts it, between "funda-
mentalism, isolationism, and biological pedantry" on the one hand
and "socio-cultural orientation" on the other.

A typical item relevant to an isolated individual is:

Even without intent to learn, practice makes perfect.

This item tests the awareness of the student that interest and
motivation are indispensable to learning. Applied to a social
situation, it becomes:

A student usually learns more by studying subject-matter that is
logically presented than by studying practical problems.

In this form, it is of special relevance to the science of education.
Other items carrying social import are:

The average convict is as intelligent as the average man, according to
Murchison.
On the whole, poverty is not a serious obstacle to the development of
a wholesome personality.

The data with respect to the social orientation of the examina-
tion items are found near the bottom of Table III. As these data
show, the junior colleges and state colleges succeed in giving psy-
chology considerably more of a socio-cultural orientation than any
of the other institutions. In all cases, however, the individual as a
social organism gets generous attention.

Terminology. One large group of items which seemed to call for

special attention was a group of questions on terminology: *e.g.*,
Limen means (1) threshold, (2) apparatus, (3) obstruction, (4) pain.

The frequencies with which terminology questions appear are shown in the lowest section of Table III.

Questions on terminology constitute, on the whole, 12.5% of all the items on the examinations. Such questions would seem to be of value primarily to those who expect to read extensively in scientific psychology. Is there not a tendency on the part of some instructors to confuse statements about the *language* psychologists use with statements of psychological *fact?*

Summary. To supplement Wolfle's able discussion of the first course in psychology, the present paper presents data obtained from analyzing the final examinations given in the first course at twenty-seven Pacific Coast institutions. After showing the distribution of the items in terms of topics, an analysis is made in terms of categories, which shows that junior colleges tend to emphasize the practical item as compared with the theoretical item emphasized by the state college and university; and that junior colleges and state colleges give more emphasis to socio-cultural items than do universities. Institutions of all types, except the one denominational college studied, stressed experimental over speculative and introspective items and psychological over philosophical and biological items. The proportion of terminological items is fairly constant in the different types of institutions.

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PSYCHOLOGY AND THE WAR

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STEUART HENDERSON BRITT

CONTENTS

PERSONNEL RESEARCH IN THE ARMY

VI. THE SELECTION OF TRUCK DRIVERS

BY STAFF, PERSONNEL RESEARCH SECTION, CLASSIFICATION
AND REPLACEMENT BRANCH, THE ADJUTANT
GENERAL'S OFFICE

In modern mechanized warfare, where operations are spread out over wide areas and the element of mobility may be decisive, heavy demands are made on the Army's transportation and communication facilities. Specialists in these fields must be developed on such a large scale that the peacetime reservoir of trained personnel is rapidly drained. Research of the Personnel Research Section on the communications problem was described in a previous article in this series, *The Selection of Radiotelegraph Operators* (2); the present article describes research on the selection of truck drivers.

Approximately forty studies, carried out in several Army installations, yielded the results to be summarized here. In some of these studies individuals and organizations outside the Army aided in loan of apparatus and the giving of tests and ratings. The problems encountered and some indication of the results to date can be arranged under three headings: criteria of driving ability, possible predictors, and validity of the predictors. Some of the tests to be mentioned herein are described briefly in manuals published by the War Department (3, 4, 5).

CRITERIA OF DRIVING ABILITY

The criterion most frequently used by the Army is an actual road test. This road test usually consists of fifteen to twenty minutes observation of the driver in a standardized situation by one or more examiners. Specified tasks are set up, errors in which can be observed and recorded with some objectivity, *e.g.*, shifting gears downhill and steering forward and backward through a narrow crooked lane. The latest revision of the Road Test Check List contains 47 such items. Two kinds of data are obtained from the road test: the number of check-list items checked as unsatisfactory—or the sum of the item weights—and a general or overall rating of driver skill. Estimates of the reliability of the criterion data in various samples have been obtained from (1) correlations between scores on the Road Test Check List and general ratings, (2) split-half correlations of scores on the Road Test Check List, (3) correlations between check-list scores given by different examiners, and (4) correlations between general ratings given by different examiners.

A large sample of ratings of Army truck drivers were collected in an early study (spring, 1941) under the direction of Dr. Harry R. DeSilva, as representative of the American Association of Motor Vehicle Administrators. When analyzed by the Personnel Research Section, these showed the usual variation of ratings between examiners* but indicated that some relationship existed between the check-list scores and the general ratings. Further exploration of the relationship between the separate check-list items and the general ratings, using records of 1,717 road tests, showed tetrachoric correlations ranging between .22 and .57. Some of the items showing the closest relationship to the general rating are "fails to use proper gear uphill," "fails to use proper gear downhill," "does not doubleclutch," and "coasts back on turnabout." Scores for the Road Test Check List can be weighted on the basis of these tetrachoric correlations. Correlations between such weighted scores and general ratings have varied in samples of one hundred to two hundred from .51 to .82. But an unweighted score, the number of "unsatisfactory" checks, correlates equally well with the general ratings, as shown by a correlation of .83 in a more recent study of 1,928 cases. These results indicate that the examiner's general rating and his checking of the separate items, whether weighted or not, are fairly consistent with each other.

The split-half reliability of the Road Test Check List, using the Spearman-Brown formula, has been computed as .82 in a sample of 155 cases. When computed by correlating scores given by different examiners at different times, the reliability is .53.

One attempt was made to improve the reliability of the check list in the direction of greater objectivity and quantification. Counts were made of the number of blocks knocked over, and measurements were made of errors, as when stopping on a designated line. For fifteen drivers the correlations between the measurements of two examiners varied from zero for a few items to .85 for time required for parking. When the fifteen most reliable items were combined as a battery, the total score on this battery yielded a reliability coefficient between the examiners of .54. Hence, this lead has been abandoned as probably not worth the extra effort.

The reliability of the general ratings on the road test has been computed by correlating two series of ratings of 127 men made on the same day by several examiners. This procedure yielded a co-

* A recent analysis of variance of the ratings of three examiners (a total of 147 ratings) disclosed a highly significant difference among the examiners.

efficient of .72. It should be emphasized that in this study the examiners received special training in rating the drivers. Ratings are not expected to yield such reliability coefficients under ordinary conditions. The fact that the ratings show a higher reliability than the quantitative measurements may be due to: (1) the simple summing of the measurements (even though weighted) as compared with the examiner's ability to construct patterns of his observations and (2) the inclusion in the general rating of some items not on the check list.

In general, the reliability coefficients for the road test are not impressive when compared to commonly used objective tests. When considered as criteria, however, the road test data are probably as reliable as those usually available for validity studies. It is likely that the reliability of the road test could be improved by proper training of the examiners.

POSSIBLE PREDICTORS

Although the road test of driving ability can be used as a predictor as well as a criterion, it suffers from the practical disadvantages of individual tests. To explore the advantages of group tests, several of the multiple-choice type have been constructed and analyzed. Tests of driver information, containing questions about safe practices, uses of instruments, simple repairs and the like have yielded split-half reliability coefficients in the .70's and .80's. Two revisions, recently completed, are expected to show higher reliability. The multiple-choice technique has also been applied to the construction of an inventory of driving experience. In addition to the factual items about experience with various vehicles under various conditions, some items of the inventory ask for expressions of preference and self-estimates. Reliability data are not yet available.

A relation between driving ability and certain visual and motor abilities has been suspected for some time, and tests have been used by civilian organizations to weed out unsafe drivers on this basis. In the hope of adapting such tests to the Army problem of identifying potential driving skill in inexperienced men, many tests of visual functions and of sensori-motor coordinations have been studied. Before considering the evidence available in the Personnel Research Section on the validity of these psychophysical tests, it will be helpful to describe the unfamiliar ones briefly and to present some data on reliability. The conditions under which

these data were obtained were not ideal for determining the maximum accuracy of the tests, but they are probably representative of the conditions under which Army tests must work.

Visual functions, daytime conditions. Table 1 gives reliability data for some familiar tests of visual acuity. Table 2 gives some intercorrelations.

TABLE 1
RELIABILITIES OF SOME TESTS OF VISUAL ACUITY

	Method	f	N
Snellen Charts	Two forms	.84	210
"	Repeat—3 mos.	.70	30
Broken Circles	Two forms	.88	117
"	"	.90	82
Telebinocular Acuity, both eyes	Repeat—3 mos.	.24	155
" " left eye	"	.41	155
" " right eye	"	.29	155
" Depth Perception	"	.41	150
Field of Vision, angular measure	Split-half	.89	208

TABLE 2
INTERCORRELATIONS OF THREE TESTS OF VISUAL
ACUITY—BOTH EYES

	r	N
Snellen and Broken Circles, Form 1	.49	115
" " "	.29	117
" " Form 2	.31	117
" and Telebinocular Acuity	.38	115
Telebinocular Acuity and Broken Circles, Form 1	.26	115

Visual functions, nighttime conditions simulated. The Biophotometer measures ability to see five faintly illuminated dots a few degrees out from the fixation point on a dark background after a period of light adaptation. A curve is fitted to the threshold-intensity of the dots plotted on recovery time; the scores are constants of this curve. The Hecht Adaptometer similarly measures threshold-intensities for the light-adapted eye as a function of dark-adaptation time. The stimulus light is at one side of the fixation point. Constants of the adaptation curve are used as scores. The Luckiesh-Moss Charts present test fields of varying degrees of contrast for discrimination. The ratio of the brightness-difference, *i.e.*, that between the test numbers and the ground, to the brightness of the ground decreases from 39.7% to 10.1%. In some installations, charts have been photographed and the films used with transmitted illumination. The Moving Target Test makes use of small test objects, *e.g.*, miniature soldiers,

weakly illuminated, which are moved slowly toward the subject until he can report their position. In the Hopkins Test of Night Vision, the test objects are under variable intensities of illumination, and the score is a function of voltage. Subjects are dark-adapted. The Intensity Discrimination Chart presents figures of decreasing degrees of contrast with a white background under dim illumination. Table 3 gives some reliability coefficients for these five tests and Table 4 some intercorrelations.

TABLE 3
RELIABILITIES OF SOME TESTS OF NIGHT VISION

	Method	r	N
Hecht Adaptometer	Repeat—10 days	.42	30
Biophotometer, 1st 5 minutes	"	.62	30
" last 5 minutes	"	.52	30
Intensity Discrimination Chart	"	.66	30
Luckiesh-Moss Charts, modified	Split-half, odd-even	.85	32
"	Split-half, 1st–2nd	.93	34
"	Repeat—4 days	.67	32
"	Repeat—10 days	.43	30
Moving Target Test	Split-half	.91	33
"	"	.93	34
"	Repeat—4 days	.33	32
Hopkins Test	Split-half	.82	33
"	"	.98	34
"	Repeat—4 days	.61	32
"	Repeat—11 days	.55	32
"	Repeat—13 days	.49	24
"	Repeat—27 days	.36	32

TABLE 4
INTERCORRELATIONS OF THREE TESTS OF NIGHT VISION

	r	N
Luckiesh-Moss Charts and Moving Target Test	.12	30
" " " Hopkins Test	.36	30
Hopkins Test and Moving Target Test	.53	30

Since accidents are often attributed to the glare of oncoming lights, several instruments have been constructed to test the ability of a driver to see letters or other test objects against a background of glaring lights. Scores can be obtained both with the glare and without. The Snellen Letters have been set up under weak illumination with a glaring light at one side. Those who can read the letters closest to the glare get the highest scores. The American Automotive Association Glare Test also uses letters. The DeSilva apparatus measures the time required for reporting the inclination of a bar after the glaring lights have been turned

off. Some reliability coefficients obtained from several Army investigations are reported in Table 5.

TABLE 5
RELIABILITIES OF TESTS OF GLARE RESISTANCE

	Method	r	N
Snellen Letters with opposing glare	Split-half	.88	208
Snellen Letters under weak illumination without glare	"	.90	208
AAA Glare Test	Repeat—10 days	.75	30
" " " without glare	"	.64	30
DeSilva Glarometer, resistance to glare	"	.32	30
" " recovery from glare	"	.36	30

It is an important question whether these laboratory tests can be used as measures of night vision under actual Army conditions, as in driving during a blackout. To answer this question a road test of night vision was set up. Test objects of cardboard, one foot square, were placed along a road on both sides. The subject, riding beside a driver, was required to press an appropriate button as soon as he saw a card on either side. The score is in terms of distance. For 27 men given two trials the split-half reliability was .77. Correlations of several laboratory tests with this road test for night vision are given in Table 6. There were about thirty cases in these samples.

TABLE 6
CORRELATIONS WITH ROAD TEST FOR NIGHT VISION

AAA Glare Test, with Glare	.03
Intensity Discrimination Charts	.15
Hecht Adaptometer	.18
DeSilva Glarometer, Resistance	.19
" " Recovery Time	.25
AAA Test, without glare	.25
Snellen Charts	.28
Biophotometer, 1st 5 minutes	.28
" last 5 minutes	.40
Luckiesh-Moss Charts	.37
Moving Target Test	.54
Hopkins Test	.55
Multiple correlation of last three	.66

Night vision in respect to race and sugar intake. It is pertinent to mention at this point some incidental evidence on night vision which has general interest. Dr. Selig Hecht, being concerned with race differences in night vision, secured scores of night vision for 119 white and 71 colored soldiers and submitted them to the Personnel Research Section. The mean score for the white soldiers

was a trifle better than the mean score for the colored soldiers. The critical ratio of the difference was 0.8. A similar study was carried out with the Wald Adaptometer. This instrument measures sensitivity to faint intensities of illumination after dark adaptation. The scores are units on a rheostat which have practically a logarithmic relation to stimulus-intensity. Hence the scores are only slightly skewed and are suitable for most statistical purposes. Scores for 921 white and 51 colored soldiers were compared and yielded a small difference in favor of the white sample. The critical ratio here was 1.7.

The effect on night vision of a high sugar intake has occasioned some discussion recently. To check on this possibility 450 of the above sample were given a highly concentrated sugar solution (Red Label Karo Syrup, unsweetened grapefruit juice, and water) 30 minutes before being tested on the Wald Adaptometer. This experiment yielded a negligible difference in favor of those with

TABLE 7
RELIABILITIES OF TESTS OF SENSORI-MOTOR COORDINATIONS

	Method	r	N
Simple braking time	Split-half	.89	117
Accelerator reaction time	"	.84	117
Vigilance braking time	"	.61	117
Accelerator reaction time	Repeat—2 mos.	.41	155
Simple steering	"	.30	154
Vigilance braking	"	.09	155
Vigilance steering	"	.34	151
Simple reaction time	Split-half	.92	208
Steadiness	"	.73	208
Simple foot reaction	"	.68	208
False reactions	"	.44	208

sugar. All the distributions from the above samples were continuous, showing no evidence for the existence of a special night-blind group.

Sensori-motor coordinations. The data reported for the smaller samples in Table 7 were obtained from a Driving-Vigilance Apparatus, designed by DeSilva and described by him in *Why We Have Automobile Accidents* (1). It is a dummy motor vehicle in which the driver sees a miniature moving road scene requiring him to steer, to brake, and to do both simultaneously. For the larger sample, the Steadiness Test is the familiar stylus to be moved between two plates. The score is the distance covered before con-

tact. In the Simple Foot Reaction, seven reactions were made; the score is the number of reactions longer than 0.6 seconds. False Reactions noted in the table refers to the number of false reactions to a distracting light in seven trials.

VALIDITY OF THE PREDICTORS

The validity of the road test as a predictor has not been investigated extensively because of its disadvantages as a practical selection device. It is worth mentioning here, however, that in a validation study on 156 selectees with a battery which included eight psychophysical tests and five items of personal data the road test was the best predictor ($r = .53$) of rating on a second road test three months later.

Many personal items, such as age, weight, driving experience, and possession of a license, which can be reported by the soldier, have been tried out in several validation studies on various samples. Since the most promising of these items have been included in the Driver Experience Inventory, the validities of these items need not be considered separately. For validation of the Driver Experience Inventory, the Personnel Research Section secured the cooperation of several Army and civilian transportation organizations in rating their drivers. A sample of 222 drivers was thus obtained: 87 rated "good" and 135 rated "poor." Since the items on an inventory of this nature are not factual, three methods of scoring the alternatives were used. Biserial correlations with the criterion ratings were .69, .75, and .81. These coefficients are presumably inflated by the method used for obtaining the criterion groups. In a more recent study of 282 drivers, with a revised form, the Pearson correlation with the five-step road test ratings was only .26. The difference between these coefficients is largely due to the difference between examiners in the ratings given. When the second sample was broken down and correlations computed within small groups rated by one examiner, the coefficients were .67, .51, .41, .09, .61. Obviously the variation between raters and that introduced by combining ratings made according to heterogeneous criteria make the problem of validation very difficult.

The problems in validating the Driver Information Test are similar to those involved in the Driver Experience Inventory. The validity coefficients likewise are of the same order. The General

Classification Test and the Mechanical Aptitude Test have shown low and zero correlations with ratings of driving skill in various samples. These figures are important in a negative way since men scoring high on these two tests are in demand for other assignments.

Attempts at validation of the psychophysical tests have not been encouraging. One early study used a sorting procedure based on biserial correlations of the predictors with the road test. Ratings on a four-point scale were available on 952 men, of whom 34.9% were rated "poor." Sorting out drivers with less than six months' experience, those with an annual mileage of less than 500, and those never licensed left 633 drivers, of whom 16.7% were in the "poor" category, and correspondingly larger percentages in the three higher categories. Such selection is apparently advantageous. A second sorting eliminated from the 633 drivers those ranking poorest on reaction time, simple steering, vigilance braking, and vigilance steering. This left 587 men, of whom 15.7% were in the "poor" category. Selection on the basis of the psychophysical tests, therefore, produced an improvement in the quality of the drivers too small for practical purposes. In one validation study with 128 men, in which the ratings were demonstrated to be reasonably reliable, biserial correlations for ten psychophysical tests ranged between .00 and .26. In a large-scale study with 1,928 men, the highest correlation of any of five psychophysical tests with the road test was .17.

In general, data from all experiments with the psychophysical tests show low positive and zero correlations and some inconsistency from sample to sample in the correlations between a predictor and the road test. This inconsistency, of some interest in itself, may be due to (1) large sampling errors associated with small populations, (2) the difficulty of establishing and maintaining in the Army conditions sufficiently stable for the more refined psychophysical tests, and (3) variations in the ratings used as criteria. A further important point, in connection with the psychophysical tests in particular, is that the soldiers are a select population with respect to physical functions. They are relatively young and those with more obvious types of physical defects have been eliminated. The negative findings in these studies of an Army population may possibly not apply to a civilian population —or to an Army population less rigidly selected.

SUMMARY

The criterion used in most Army research on the selection of truck drivers has been a road test of driving skill. Under optimum conditions the road test has shown a fair degree of reliability; under more usual conditions the reliability may be low. The predictors used have been the road test itself, multiple-choice tests of driver information and experience, and various tests of visual and sensori-motor functions, such as visual acuity, night vision, and reaction time. The road test is not practicable, since it is an individual test which requires experienced examiners, expensive equipment and a testing period of about twenty minutes per man. The Driver Information Test and the Driver Experience Inventory have the advantages of group tests. They have shown promise in experimental studies, but complete data are not yet available. Some of the psychophysical tests studied have shown high split-half reliabilities, but most of the repeat reliabilities are low. Validity data for them have been disappointing. Probable reasons for the low validity coefficients have been discussed. Because of the low validities and the difficulties of administration of these psychophysical tests under Army conditions, their routine use for selection purposes is not considered advisable.

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PERSONNEL SELECTION AT AN ENGINEER REPLACEMENT TRAINING CENTER

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The purpose of this paper is to discuss some of the problems relating to personnel selection at an Engineer Replacement Training Center, to describe the present methods of solving them, and to mention studies toward more effective methods.

I. THE PROBLEMS OF SELECTION

The military mission, as of November, 1942, of the Center under discussion is realized through the following courses:

1. A twelve weeks' comprehensive course in basic and general military engineering subjects. The graduates of this course are prepared to go either to field units as replacements or to Officer Candidate Schools as student officers, depending on their qualifications.

2. A five weeks' less comprehensive course in basic and general military engineering subjects. The graduates of this course are usually enrolled in specialist courses, either in the Center, in military schools elsewhere, or in civilian schools. In these schools they are trained from five to twelve weeks in such specialties as auto mechanics, welding, geodetic computing, and surveying. After completion of these courses, the men are transferred to field units as replacements, or to more advanced schools.

3. An eight weeks' course in elementary education, plus military and engineering subjects. Men are prepared for one of the following dispositions: (a) transfer to either the five weeks' or twelve weeks' training course, provided improvement is sufficient to indicate prerequisite qualifications; (b) transfer out of the Center to restricted assignments, for those who have physical handicaps disqualifying them for full field duty but not severe enough to preclude some usefulness to the Service; or (c) discharge from the Army because of physical, mental, or emotional handicaps which preclude usefulness to the Service.

4. Several courses in military specialties, of five to seven weeks.

In other words, the problem of selection resolves itself into selecting men for: (a) Officer Candidate Schools, (b) specialist schools, (c) basic engineer soldiering, and (d) elimination from the service. The problem is greatly complicated, however, by many practical necessities. Among these are: the large number of men to be processed; the restricted time available; the many other

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matters with which the selection must be coordinated, such as issue of supplies and equipment, medical processing, train schedules, training requirements, available housing and training facilities; sudden changes, with little or no notice, of the quotas of men to be furnished in various categories; the unavailability at the time needed of tentatively selected men because of sickness, confinement, quarantine, or higher priority needs; the preparation of many of the classification reports, involving evaluation and judgment, by personnel who have had insufficient experience in selection; and the continuous turnover of trainer, administrative, and selection personnel dictated by the necessity of furnishing experienced personnel to new and expanding organizations.

II. The Selection Procedures

An effort is made to minimize the detrimental influence of the above-mentioned problems by making selection a continuous process, closely coordinated with the training program, becoming more refined as required by the successive stage of training and as facilitated by more pertinent data accumulated during the training. This procedure has the following advantages:

1. The initial selections can be made by relatively new and untrained personnel, thus reserving the trained and more efficient personnel for the more refined and specialized problems of selection.

2. Each stage in the selection program can be handled in a minimum of time.

3. Readjustments can be made at various stages of the training program, in the light of information accumulated about the men during their training.

Assignments to the Branches of the Service. This highly continuous process of selection begins at the Reception Centers, where men stay for a few days after induction into the Army, and extends through the entire career of each soldier. One of the functions of the Reception Centers is to assure that men are assigned to the branch of the Service in which they can be of most value. In addition, they record on a permanent record, the Soldier's Qualification Card, information of permanent value which will be helpful later in more refined selection and assignment. This information includes, among other things, such data as formal education, major school subject, main and second best civilian occupations, facility in foreign languages, previous military experiences, hobbies, sports, talents for furnishing entertainment, recom-

mended military assignment, and the results of various standard-
ized tests. These tests include measures of general ability as well
as aptitudes in specific fields. This information, with the exception
of test results, is obtained in interviews with the soldiers. The
validity of certain statements of occupational experiences may be
checked, at the discretion of the interviewer, by means of oral
trade questions.

The information, just outlined, is the basis for assigning men
to the various branches of the Service. Consequently, the men
who arrive at the Engineer Replacement Training Center are
selected for it because their qualifications seem to indicate that
they could be of as much or more value in the Corps of Engineers
as in the Infantry, Field Artillery, Air Forces, or any other branch.

Preliminary Assignments Within the Center. As soon as the men
arrive at the Engineer Replacement Training Center, another
selection is immediately accomplished. This must be achieved in
a very short time, since it must precede assignments to training
units, quarters, and beds, and the allotment of rations. The
selection of 500 men requires about one hour and can be achieved
from information on the Qualification Cards. The selection is
based on the following criteria:

1. Scores on the general ability test, called the Army General Classi-
fication Test, and with norms designed to assign grades I, II, III, IV and
V to 7%, 24%, 38%, 24% and 7% respectively—grade I being the
highest.
2. Formal education.
3. Main and second best civilian occupations.

The newly-arrived men are placed in one of the following
training units according to their qualifications:

1. *Potential officer candidate training units:*
   a. Grade I on the AGCT (Army General Classification Test).
   b. Grade II on the AGCT and high school graduation.

2. *Non-specialist training units*
   a. Grade V on the AGCT.
   b. Grade IV on the AGCT and less than grade school graduation.

3. *Specialist training units:*
   a. Civilian occupations equivalent, or closely related, to military
   specialist training to be given, and not having qualifications men-
   tioned in "1" or "2" above.

4. *Pre-specialist training units:*
   a. Grade II on the AGCT and less than high school graduation.
   b. Grade III on the AGCT.

c. Grade IV on the AGCT and grade school graduation, all three of these only if not included in "3" above.

Both "3" and "4" above are pre-specialist training units for the first five weeks. The only difference is that men in unit "3" go from pre-specialist training into specialist training; while the men of "4" are, in general, prepared for transfer out to specialist schools elsewhere.

These differential assignments have the following advantages:

1. They provide for adoption of the training program to the ability of the men.

2. They restrict the type of administrative problems with which the officers and enlisted instructors of each unit have to be concerned.

3. The men of each unit, tentatively scheduled for a particular class of future training, can be further studied as to their qualifications, and reassignment can be more effectively accomplished.

Reassignment Due to Health Deficiencies. Concrete steps toward reassignment are initiated during the first two days of training. During this period, each platoon leader interviews his men in an effort to discover any physical defects which may not yet have been noticed. Men found to have physical defects are routed through the appropriate channels to the various medical and other facilities available. They include:

1. Medical treatment at the dispensary.

2. Referral to a specialist at the station hospital.

3. Referral to the Consultation Service of the Center Headquarters. This latter corresponds closely to a mental hygiene team in civilian life, and includes on its staff a psychiatric officer, a psychological officer, a trained psychiatric social worker, and selected enlisted personnel with the most appropriate educational and experiential backgrounds locally available.

4. Transfer to the physical section of the elementary training unit. This section provides for those who are unable to carry on regular training reasonably well without undue danger to themselves or others because of some physical limitations inappropriate for hospitalization, yet not remedial within ten days.

The findings accumulated in the above procedures are entered on a medical record and are transferred later to the Qualification Card where they are available in making future assignments. Each man on whom a medical record is initiated is classified for one of the following dispositions:

1. Discharged for limitations.

2. Limited service, which restricts the man's assignment to occupations compatible with his limitations.

3. Full field duty.

Reassignments of the Retarded. While the above described measures appropriate to health deficiencies are being taken, other measures toward appropriate classification, reassignment and training of those markedly deficient in mentality, education, motor coordination and socio-psychological adjustment are being made. Particular attention is directed to isolating these individuals during the first two weeks of training. Each platoon commander is requested to be on the alert for men with any of the following characteristics: (a) inability to read a letter; (b) inability to write a letter; (c) crying; (d) unusual temper outbursts; (e) alcoholism; (f) chronic complaining; (g) continuously in difficulties; (h) "undesirable" habits and traits of character; (i) lack of adaptability to the Service; (j) continuously "riding" the sick book; (k) extremely nervous in certain training situations, such as firing, or demolition training; and (l) marked deficiencies in various aspects of the training, even after individual training and attention.

In addition, the platoon commanders are given the names of all men who made grade V on the Army General Classification Test. They are requested to observe all retarded men carefully so as to arrive at a decision as to whom to recommend for special development training. They are asked to recommend: (a) all men whom they feel will be of greater usefulness after special development training, and (b) all whom they feel cannot be of use unless they are improved by such training. The specific reasons for the recommendation are stated in each case. Those recommended are tested, interviewed, and observed in the execution of basic drill by a psychological officer who considers the following points in his evaluation of each man: (a) occupational history, (b) educational history, (c) pre-army social adjustment, (d) economical achievements, (e) motor coordination, (f) test results, and (g) army adjustment.

The following dispositions of the individuals are available to the psychological officer:

1. Return to regular training.
2. Referral to the psychiatric officer.
3. Transfer to a special development training unit.
4. Therapeutic suggestions to the individual or his company officers, or both.

Those returned to regular training are, in general, given no further attention by the psychological officer unless additional requests are made by the company officers. Those referred to the psychiatric officer are examined more completely. This includes at least one or more interviews by the psychiatrist, and may include the preparation of a case history by the Red Cross social psychiatric worker, a comprehensive medical study, and a therapeutic program. During the investigation, the soldier may be hospitalized, retained in regular training, or transferred to special development training. Those who are transferred to special development training are carefully observed by their new platoon commanders. On the basis of their observations, and reports from the medical, psychiatric, and psychological officers, the platoon commanders make recommendations for one of the following dispositions:

1. Discharge for limitations.
2. Classification as limited service and transfer out of the Replacement Training Center.
3. Return to regular training for completion of that course.

These recommendations in conjunction with the records on the individuals are reviewed by the psychological officer. Additional studies of the individuals are completed if deemed essential to a competent solution. The recommendations are approved or readjusted, and appropriate action then follows.

Reassignments to Training Units. While appropriate attention is directed to solve the problems of limitations in health, education, mentality, motor-coordination, and socio-psychological adjustments, other procedures are under way to secure additional information which will assist in making reassignments, at the end of five weeks, of potential officer candidates, specialists and non-specialists, and to facilitate assignment to particular specialist schools.

The first step in the reassignment to training units requires that each trainee complete a questionnaire on education, experience, and interest, as related to each of the many specialties for which men are selected.

The questionnaire includes high-school, trade-school, and college subjects which are closely related to any of the specialties for which trainees are selected, and requires the trainees to indicate how many years in each school he studied the subjects, together with a statement of his grades

as below average, average, or above average. In addition, the question-naire contains five to ten occupational questions pertinent to each specialty. These are designed to determine how much occupational ex-perience each trainee has had in that or related specialties. The last section of the questionnaire lists all the many specialties and requires the trainees to indicate their first ten preferences.

The information from the questionnaire, the Qualification Card, and the test scores is supplemented by reports from the platoon commanders, who have vigorously trained the men for four weeks. The preparation of this report by platoon commanders is facilitated by the fact that the trainees during the training are in three groups—potential officer candidates, potential specialists, and potential non-specialists. The platoon commanders report the names of those whom they think should be reassigned, with the specific reasons in each case. The recommendations usually include reassignments between potential officer candidates and potential specialists, and between potential non-specialists and potential specialists. Most of the recommended changes represent borderline cases, and often the number needed determines the final disposition. An additional report is required from the platoon commanders in the case of all trainees who obtained grade II or better on the Army General Classification Test. This is in the form of leadership ratings of potential officer candidates and utilizes Thurstone's paired comparison method, whereby each trainee is compared, on the quality under consideration, with every other trainee.

The first step in selecting specific individuals concerns itself with the potential officer candidates. The number of possible candidates is reduced at this time, and some are reclassified as potential specialists. The number eliminated at this time depends on the estimated number of officer candidates who are to be fur-nished from the group after they have completed an additional seven weeks of training. An effort is made to retain at least twice the number needed. This is not always possible because of the heavy demands for both officer candidates and specialists. Those held are in general the ones with the higher leadership ratings. All college graduates in engineering are held, regardless of their leadership ratings. Those individuals who are not high-school graduates must rate as high or higher on leadership than the average of the others retained, who have more education. In

general those are not held whom the platoon commanders have specifically recommended as potential specialists rather than potential officer candidates.

Selections for Specialist Courses. The next step is to consider the records of all the potential specialists and assign them to specific specialist courses. The method for this selection is to provide a "pigeon hole" for each one of the thirty or more specialist courses, representing a reasonably wide range and variety of specialties. All of the records for twelve hundred men are gone over one by one to select men for from 1050 up to 1200 assignments. After study, each record is placed in that one "pigeon hole" which seems to represent the course for which the individual is best fitted. This method leads to a discrepancy, which is readjusted, between the number tentatively assigned to each course and the quota for that course. Wherever there are overages, the records are again carefully analyzed and a sufficient number of the least well qualified are withdrawn so as to make the assignments equal the quotas. Those withdrawn are used to fill the courses where there were shortages. The individuals not assigned, if any, are retained for training as non-specialists; that is, they take seven more weeks' training as basic engineer soldiers and then are transferred to field units as non-specialist replacements. At their new units they may compete for specialist school assignments and non-commissioned officer grades. The following principles are applied in making the selections:

1. Valid evidence of successful experience in a specialty, or in a closely related one, is the best single indication of suitability for that specialty.

2. Interest is a highly significant factor only if based on experience in the specialty, or at least detailed knowledge of it.

3. Interest cannot compensate for insufficient aptitude.

4. Courses in closely related school subjects with good grades, or with better grades than in other subjects, are valid evidences of suitability for a specialty.

5. Closely related hobbies, if conscientiously and continuously followed over a period of years, are valid evidences of suitability for a specialty.

6. Other things equal, individuals should be selected for those specialties which utilize the most of their abilities and aptitudes.

7. The shorter training courses should receive the better qualified men, provided other considerations are equal.

8. The minimum educational background requirement for each specialty should be met.

9. Borderline cases should be selected only when the school quotas cannot be met without them.

After the selections are made, the school assignments are published in orders. Prior to this time the platoon commanders have been informed concerning many of the problems and principles involved in the selections. The platoon commanders are thus able to answer inquiries which the men have about their assignments. Also they are able to judge between mistaken assignments and lack of appreciation on the part of the men as to the principles involved. The suspected misassignments can be reported for reconsideration. The men lacking appreciation of the principles and problems of selection can usually be enlightened and convinced of the wisdom of the assignments. Records of the data accumulated are kept on all the men, and evidences of achievement in the specialty assignments are obtained from some of the schools and serve as a basis for follow-up studies designed to improve selection. For those relatively few individuals who attend specialist schools at the Center, provisions are made for reassignment. Any instructor who feels that a reassignment is appropriate may recommend it to the assignment officer, together with the reasons. The assignment officer studies the case and takes the action deemed by him to be appropriate.

Selections for Officer Candidate Schools. Mention has been made of how certain potential officer candidates are reclassified at the end of five weeks of training, on the basis of leadership ratings and education, and are assigned to specialist schools. Those who remain as potential officer candidates are continually studied. Their platoon commanders try them out in leadership assignments so as to obtain more valid estimates. Their comparative leadership ratings are posted on the bulletin boards so as to create greater competition. The last civilian school they attended is requested to furnish their relative grade standing in the highest grade completed, together with a statement of the number of students in the class. All the information available on each man, including that customarily available on men selected for specialist schools, is furnished a board of officers which is charged with selecting the best qualified applicants. This board first meets during the ninth week of training, carefully studies all the information and interviews each applicant. The interviews cover such information as positions of civilian and military leadership, social adjustment, education, occupation, hobbies, and general knowledge. Each applicant is tentatively approved or disapproved. These tentative decisions are furnished to the company officers and the applicants.

The company officers are requested to make recommendations for reconsideration during the twelfth and last week of the training course. This method of reconsideration is based on the assumption that the company officers, who train the men, are in a more favorable position to judge their qualities. The break between approval-disapproval as set by the board furnishes them the standard and enables them to recommend interchanges which make the break more clear-cut. Further study of the cases recommended for reconsideration usually leads the board members to accept the recommendations of the company officers. The finally disapproved cases are transferred out to field units at the completion of their training at the Center. Here they may continue to compete for officer candidacy, specialist schools, and noncommissioned-officer grades.

Qualification records are kept on those who are transferred to the Officer Candidate School, and achievement records are obtained from the School. These are compared and studied in an effort to improve selection. A recent study divided those transferred to the Officer Candidate School into the following three categories, according to their most advanced civilian school graduations: (a) college, (b) high-school, and (c) grade school. The high-school graduates were found to have the greatest percentage of failures. They probably exceeded the grade-school graduates, because the grade-school graduates were required to have higher leadership ratings in order to be considered for the School. Consequently, the minimum leadership rating for high-school graduates was increased.

III. SUMMARY AND CONCLUSIONS

This paper briefly outlines the mission of an Engineer Replacement Training Center and describes the various techniques, methods, and principles applied in selecting men for the various courses and schools. It shows the great influence of psychology in one sphere of building an army. It illustrates how psychological techniques, methods, and theories can be applied in practical ways, replacing long established, less scientific approaches. These accomplishments seem to indicate that applied psychology is destined to have a great expansion in future peaceful reconstruction and achievements.

PROFESSIONAL SERVICES AND TRAINING REQUIREMENTS OF THE PSYCHOLOGIST IN CLASS H-V (S) OF THE NAVY[1]

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I. PSYCHOLOGICAL SERVICES IN THE NAVY

The United States Navy has long shown interest in the contributions of psychologists to the solutions of numerous naval problems. This fact has been indicated earlier by Jenkins (7) and Louttit (16, 17). It, too, has been recently demonstrated by two surveys (28) in which the names and military assignments of psychologists in the various branches of the armed services are reported. In line with these and other pertinent discussions the present paper has been prepared. Its aim is twofold. First, it is proposed to discuss, within the limits of military secrecy, the nature and the duties of one group of psychologists within the United States Naval Reserve. In this way the Psychologist in civilian life can become still more familiar with the practical ends to which psychological training can be directed. Second, and a corollary of the first, the following paragraphs may provide psychologists in colleges and universities with a knowledge of the skills most useful in one arm of the Naval Reserve. These facts, taken in conjunction with those already offered by those in the Navy (7, 12, 16, 17) and those now available from the Army (3, 4, 9, 22, 23, 31), should serve to aid in the orientation of psychological training programs (1, 6, 18) in universities toward the facilitation of the war effort.

The military psychologist within the United States Navy is ordinarily assigned by virtue of the specialized nature of his training and experience to one of the following three arms of the service.

First, he may be ordered to active duty in the aviation branch of the Naval Reserve. When this is the case he assists in the selection and placement of men for flight training. Whatever the specific nature of these duties (7, 16, 17), however, the psychologist functions in a technical and advisory capacity to flight officers, flight instructors, and flight physi-

[1] The opinions and assertions contained in this paper are those of the authors and are not to be construed as official or as reflecting the views of the Navy Department or the naval service at large.

cians. For the sake of easy designation this psychologist, along with other specialists of service in aviation medicine, is termed an Aviation Volunteer Specialist. This characterization is frequently abbreviated the A-V (S) division of the Naval Reserve.

Second, the psychologist may be assigned to duties within D-V (S). He, as a commissioned Deck Officer Volunteer Specialist, is charged with the development and advancement of personnel programs underway at naval bases and stations. His duties are chiefly those of a personnel officer who aids in examining, selecting and placing trainees, following their basic military ("boot") training, in special service schools for advanced training. He, accordingly, materially helps in designating the men likely to profit most rapidly from specialized training in those skills needed at shore stations and on ship board. The Deck Officer Specialist consequently develops and administers general educational achievement and specialized aptitude tests in order to provide the Navy with a continuous and ever adequate supply of trained personnel. In the effective execution of these assignments the psychologist must be experienced in the use of interview techniques, the administration of achievement (arithmetic, English, and spelling, to illustrate) examinations, and in the interpretation of scores earned on aptitude tests (mechanical and clerical, for example). He, too, must be familiar with general-intelligence tests; and able to administer and interpret them. By means of these techniques the psychologist, as a naval personnel officer, assists in making the most appropriate assignment of each man, upon the latter's graduation from "boot" training, to that arm of naval service most warranted in terms of the man's abilities, past achievements, aptitudes, and interests.

Third, he may be appointed to serve as a Hospital Volunteer Specialist. When thus commissioned he is assigned, in abbreviated designation, to Class H-V (S)[2] and to serve in connection with duties within the Medical Corps. While numerous psychologists within this category are ordered to duties in naval aviation,[3] others are directed to assist in the examination and selection of recruits at naval stations that have been specifically established to provide basic military training for recruits upon their entrance to the service. These psychologists accordingly assist the medical officer in the initial selection of trainees who enlist or who are inducted by way of Selective Service channels. It is to a detailed description of the duties of the psychologist as a specialist in Class H-V (S) at a naval training station that attention is now turned.

II. PSYCHOLOGICAL SERVICES IN CLASS
H-V (S) AT GREAT LAKES

Prominent among the activities of the psychologist in H-V (S) is his close professional relationship with the psychiatrist and

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[2] This psychologist is a staff officer in contradistinction to the psychologist in D-V (S) who is a line officer.

[3] The research duties of certain psychologists in any one of these three categories are not discussed in this, a general consideration of divisional functions.

other members of the medical profession. Indeed, clinical psychology and psychiatry function concurrently at The Great Lakes Naval Training Station in a joint attempt to eliminate at the outset recruits who are basically inapt and unfit for naval service. Shortly after their arrival at the shore station, the recruits are subject to a summary psychiatric interview which is held in conjunction with the routine physical examination. The purpose of this interview is to detect the existence of neurologic, psychiatric, and psychologic defects that would serve to hinder the recruit's subsequent adjustment to naval regimens. When such defects are observed, the recruit is detained and then transferred to an observation ward for additional study.

During the preliminary examination it is frequently found necessary to conduct brief psychometric examinations to determine the existence of subnormal intellectual development. For the purpose of arriving at a rough approximation of mental abilities, the Kent *Oral Emergency Test* (8) has been found of value. This test, requiring from eight to ten minutes to administer, has been shown appropriate for the examination of naval personnel (10), and has been demonstrated to correlate surprisingly well with more detailed and precise tests of intelligence (2, 5, 11, 25). No final diagnosis of mental deficiency, however, is made on the basis of this test alone. Recruits receiving suspiciously low scores are reexamined with more extensive psychometry during the period of their observation.

In addition, the existence of illiteracy is customarily discovered during the preliminary psychiatric examination already mentioned. The Navy sets forth no specific educational requirements for enlistment; however general provisions in this regard are to be found in paragraph 1404 (a) of *The Manual of the Medical Department of the United States Navy* (30):

No educational standard has been officially established for recruits presenting themselves for enlistment in the naval service. The regulations require, however, that a candidate shall be able to read and write and that he should possess reasonably quick and clear understanding.

Thus, while no generally accepted criteria of illiteracy exist, it has been found profitable and practical at this station to measure reading ability for naval services by testing the recruit with selected passages from the *Bluejacket's Manual* (29). This manual, issued routinely to each recruit during his initial period of training, is a volume containing instructions and general information per-

taining to Navy life and training. It accordingly contains material that the recruit may normally be expected to read during his naval career. More detailed discussions of the problem of illiteracy and its measurement are found elsewhere (12, 13).

Recruits held over for further study because of suspected psychiatric or psychologic disabilities are barracked in an observation ward where thorough psychiatric and psychological examinations are conducted for the purpose of determining the exact nature of the existing disability. In this ward, known as the Neuropsychiatric Unit, psychiatrists and psychologists collaborate in attempting to differentiate between those recruits whose defects render them unfit for military service and those whose defects are minor and would not preclude satisfactory military adjustment. It is well to note that while recruits are placed in the observation ward because of specific psychiatric and psychologic disabilities, it is frequently found that cross references between psychologists and psychiatrists are necessary in arriving at a final disposition.

Because of the national emergency, psychometry in the Navy must necessarily be expeditious. Involved and time-consuming tests, while frequently of value, generally are not practicable when large numbers of persons must be examined in relatively limited periods of time.

The *Bellevue-Wechsler Adult Intelligence Scale* (26) has been found acceptable as a testing instrument at this station since its administration is not too prolonged and inasmuch as it has been standardized for use with adults rather than exclusively for children and adolescents. Because of its content, it appeals even to the more mature recruit. The fact that half of the items are nonverbal permits these tests to be used in the examination of individuals with language disability. Further, the interpretation of the psychometric pattern by the psychologist is often of marked value to the psychiatrist in his arrival at a differential diagnosis. Evidence that relatively consistent psychometric patterns exist among patients with certain types of psychiatric and neurologic disabilities has recently been advanced (20, 21). The discriminative value of the various subtests of the examination among subnormal intellectual groups of both civilian and military status has likewise been determined (14, 15, 27).

Recruits temporarily held under observation in the Neuropsychiatric Unit may be dealt with in one of several ways. If found normal, they are sent to duty and their cases are then closed. If they exhibit disabilities of a minor nature, they are sent to "trial duty" with their company for a period of two or three

weeks after which time they report to the Unit for re-examination. If they are progressing normally and show no signs of maladjustment, they are returned to duty and their cases are closed. If found to be adjusting poorly, as evidenced by their Company Commander's report, they are readmitted to the observation ward for further study and other disposition. Those recruits found to be suffering from severe neuropsychiatric disorder are hospitalized, while those adjudged unfit for naval service in the opinion of the examining psychologists and psychiatrists are discharged from the service by special order. The special order discharge is recommended only after the case has been reviewed by the Aptitude Board.

The Aptitude Board, convened by virtue of military directive, consists of one line officer, one medical officer of the regular Navy, two psychiatrists, and one psychologist. The purpose of this board is to review the findings of the psychiatrists and psychologists and to make recommendations concerning the recruit's discharge by special order. Because of the heterogeneous composition of the Board, several viewpoints are represented and thus practical and appropriate action on each case is possible.

Psychologists and psychiatrists of the Neuropsychiatric Unit are concerned not only with recruits referred during their preliminary examination, but also with those recruits whose difficulties developed or were first revealed during their period of "boot" training. Such recruits are referred from several sources, including dispensaries, company commanders, and service schools.

The examination of prisoners referred by the Discipline Office is also a function of the Unit. Men referred from sources other than the preliminary examination are dealt with in the same manner described above. Final action in each case is likewise taken by the Aptitude Board.

The psychological services recounted in the foregoing paragraphs are those rendered in conjunction with the Neuropsychiatric Unit at this training station. Variations in policy are doubtless to be found at other shore stations. It is safe to generalize, however, that coordination of medical, psychiatric, and psychological procedures is an effective policy in the elimination of those recruits who would be unable to withstand the stress and strain of military life due to existing or potential neuropsychiatric conditions and intellectual deficiencies.

III. Professional Training Needs of the Military
Psychologist in Class H-V (S) at
the Shore Station

The preceding descriptive analysis of the duties performed by the psychologist in Class H-V (S) of the Navy leads directly to a consideration of the optimal training necessary for successful performance in this field of wartime endeavor. Although differences of opinion might exist on the exactness of any statement offered below, it is the opinion of the writers that the following specialized disciplines are of such paramount value that training in them is well nigh essential.

First, the psychologist, assisting in neuropsychiatric examinations, should be well trained in the field of experimental psychology and in, perhaps, one or more laboratory sciences. The major reason for the inclusion of such an emphasis lies in the fact that in this way the psychologist becomes familiar at firsthand with the scientific method. He is able consequently to discriminate between fact and fiction. He is able to recognize variables and to avoid errors in formulating cause and effect relationships. The skilled utilization of the scientific method provides the psychologist with a tool that implements his use of the raw data obtained in his clinical interviews.

Second, the psychologist who performs the functions described above, must be familiar in a very real and basic sense with the fundamentals of general and abnormal psychology. Although he never serves as a psychiatrist, the more knowledge he possesses the greater his contribution to the resolution of many medical problems arising during recruit "mental" examinations. To correlate these two functions, the psychologic and the neuropsychiatric, the aforementioned method of cross-consultation is an integral part of the local Unit. A knowledge of what is known about normal-abnormal behavior patterns and particularly of the numerous syndromes commonly encountered in the broad field of psychopathology is absolutely essential.

Third, the military psychologist advisedly should be equipped with a general knowledge of clinical psychology and a very specialized knowledge of, and skill in, mental measurements. He, for example, must know the most effective means for the rapid collection and recording of clinical data in the preparation of the case history. He needs skill in the discrimination of the immediately relevant from the remotely pertinent. He should be able to administer tests of general and special intelligence. He, in addition, should be able to interpret each man's performance scores. Training in the use of the scientific method is here of decided value.

Fourth, the psychologist in Class H-V (S) does well to be familiar with the sciences of physiology and neurology. Even a cursory familiarity with the structure and functions of the human central nervous system cannot come amiss. The more detailed this knowledge of the neurological basis

of human behavior, the more successful, other factors being equal, will be the psychologist's efforts in dealing with organic cases. Finally, the ready availability of the skillful use of the interview technique cannot be underestimated as a valuable asset.

Thus, in summary, experimental, abnormal, and clinical psychology contribute in a very material sense to military psychology and psychiatry as employed in the Navy's training stations. In addition, knowledge of the neurological and psychophysiological basis of behavior and the adept use of the interviewing technique add pertinent skills to these fields of specialization.

For those psychologists located in colleges and universities and for those who are faced with the readjustment of departmental offerings during wartime the following suggestions may prove of value. In the preliminary and advanced training of the young psychologist interested in the United States Naval Reserve emphasis should advisedly be placed upon the fields mentioned below. The "major" in psychology should be required to obtain training in Experimental, Abnormal, Clinical, and Personnel Psychology (1). He should acquire the skills pertinent to the administration of group and individual tests of intelligence; to learn the mechanics of interviewing; to master the rudiments of statistics sufficiently well to comprehend the meaning, and to use the methods for the determination of the validity and reliability of testing devices. Training in psychophysiology and neurology also should be made to supplement the study of Experimental, Abnormal, and Clinical branches of current psychological theory and practice. The young psychologist also might well become familiar with the problems of military leadership and discipline, the better to adapt to the military environment and its new demands upon commissioned staff and line officers. This point has been stressed previously (18, 19) and has been indirectly suggested by Smith (24). Following the mastery of these fields and their specialized techniques the graduate psychologist about to enter the military services will likely be able to adapt more rapidly to the demands made by the branch of his service.

IV. Summary

The purpose of the present paper has been to describe briefly the nature of the services rendered by psychologists in the United States Naval Reserve with special emphasis placed upon the duties of those assigned to Class H-V (S) of the Medical Depart-

ment at a shore training station. Several suggestions, the out-growths of experience in the latter situation, have been made for the benefit of civilian psychologists actively engaged in the re-arrangement of curricular offerings in colleges and universities. These descriptions and suggestions, coupled with others available from other arms of the services, may, it is hoped, help to answer often raised questions pertaining to the training needs of the military psychologist.

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COLLEGE CURRICULUM ADJUSTMENTS IN PSYCHOLOGY TO MEET WAR NEEDS

REPORT OF A COMMITTEE OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION*

It is conservatively estimated that 1500 psychologists with the M.A. or Ph.D. degree will be in the service of the Government in military or civilian capacity within 1943. An even larger number of those with more limited psychological training will be carrying responsibilities essentially psychological as personnel technicians and in related capacities. There is also need for trained psychologists outside the Government employ, for civilian services such as child care and training, industrial personnel work, and work in the schools. One responsibility of colleges and universities is to provide accelerated training to meet the immediate need for competent psychologists.

But the colleges and universities have another responsibility as well. There is unmistakable need for a well-trained citizenry, non-psychologists with sufficient understanding of themselves, of their fellow human beings, and of social behavior, to participate effectively as citizens in the solutions of the enormous problems of the war and of the post-war period. Psychology can and should be a part of a general educational program concerned with producing individuals capable of meeting successfully the problems of a democracy faced with the contemporary threats to its existence.

The different demands on psychology present different instructional problems. For convenience, three levels of instruction may be distinguished:

I. A general introductory course, intended for students who, in the vast majority of cases, will not become psychologists.

II. Special training courses for immediate service in the war effort. Most of these courses will be given in connection with the special training programs of the Army and Navy. They will be administered by the Army and Navy, but the curricula are being arranged with the advice of professional psychologists.

III. Advanced graduate work for research specialists.

It should be understood that the recommendations in this report apply only to the immediate problem put to the Committee: How can the teaching of psychology in colleges and universities be better adapted to wartime needs and conditions? Where no fundamental changes are advised, this does not imply that the present training is above criticism; but rather that no changes intended specifically to render the training more appropriate to wartime needs are recommended.

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I. The General Introductory Course

Major attention is given in this report to the general, introductory course, since for the majority of students it is their only formal contact with the science. Important as is the work of preparing persons for further study of psychology or for service as psychological technicians or research specialists, the more fundamental purpose is to contribute to the student's general education by helping him to a better understanding of himself, his associates, and the psychological aspects of society.

In the Committee's opinion, "defense" courses in military psychology —no matter how excellent these may be for certain purposes—should not *supplant* the basic general course. The Committee believes that this course should present fundamental concepts, principles, and methods; the fact that the country is now at war does not lessen the importance of this function of the course. At the same time, the war does emphasize the point that fundamental concepts, principles, and methods should be presented in their bearings on the problems of human living. The course should emphasize the study of human learning; biological and social motivation; behavior adjustments in the solution of intellectual, social and personality problems; individual differences in ability and experience, and the resulting variations in personality, achievement, and learning. Methods and problems involved in the prediction and control of human behavior should be stressed.

It is especially recommended that those topics receive special emphasis which will aid the student to adjust to wartime conditions and contribute to his usefulness in the years when peace is to be achieved. The Committee believes, for instance, that psychology can be of more immediate service if time-honored and classical references are replaced by data more relevant to modern problems; if, for example, discussions of learning deal with human learning in personal and social adjustments as well as in the acquisition of skills; "heredity" with the problem of human traits and drives as related to biological inheritance and also to the social environment in which they are developed and utilized; perception with current problems in the Army Air Force. Many other examples will occur to the instructor. Special attention should be given to problems of social behavior, since the issues of the war raise emphatically the need for understanding the relation of men to each other.

There is, as is well known, a division of opinion as to how the basic course can best accomplish its function in the general education of the student.

Some psychologists prefer to organize their teaching about topics selected as representing the major concepts and principles of psychology. To them the Committee suggests the need of carefully relating these topics to contemporary problems, utilizing illustrations, experiments, and other materials which can be carried over by the student directly into his daily life. These psychologists will find in *Outline A* (below) an organization which utilizes the topical chapter headings in most standard textbooks. Under each general heading are suggested sub-topics which will relate the discussion to contemporary problems. The outline is intended to be suggestive and not final. The order of topics is flexible; instructors

are urged to change and amend as they see fit. Many sub-topics are arbitrarily classified and may be switched to other headings. For supplementary reading the book "Psychology for the Fighting Man" being prepared by Professor Boring and a special subcommittee of the National Research Council's Emergency Committee in Psychology should be a useful reference. This book will be published during the early months of 1943. For supplementary reading the instructor is also referred to the reading references below.

Outline B has been prepared for those psychologists who believe that a course built about selected problems is to be preferred to one built about the conventional topics used in most textbooks. Many psychologists are convinced that a course so organized will more effectively fulfill its function in the student's general education, and also that it may bring about a needed revitalization of psychology. In *Outline B* the topical headings are contemporary problems, and representative readings are grouped about sub-topics under them. In such a course, organization naturally changes as problems rise and fall in relative importance in the life of the student and in society. This outline, too, is intended as suggestive and not final.

Following the outlines is appended a list of *Instructional Techniques*, suggested as appropriate to courses following either mode of organization.

OUTLINE A: GENERAL INTRODUCTORY COURSE

1. *Heredity and Environment*

   Is the tendency to fight inherited; is cruelty "innate"?
   The "roots" of war;—in nature or nurture?
   The influence of tradition and of culture patterns (e.g., Japanese).
   Are some nations more warlike than others?

2. *Individual Differences*

   What are the ranges of human abilities which must be recognized in war and
       peacetime selection problems?
   Race: attitudes conducive to war and peace.
   Sex: women as substitutes for men in industry, Waacs, Waves, etc.
   Age: importance in military service, leadership, industrial efficiency, progressive government.
   Tests in the service: intelligence, personality, psychiatric, aptitude.
   Problems of military personnel: selection, classification, training.

3. *Motivation and Adjustment*

   Are there instincts; is pugnacity an instinct?
   What "drives" may be utilized for peace?
   What are the *dependable* motives, how may they be used in war?
   What factors enter into effective propaganda: radio, movies, newspapers,
       books.
   Factors in military discipline: love of country, respect for commander, influence of associates.

4. *Perception and Observation*

   Sound localization in airplane observation; judgment of distance and depth;
       time judgment.

Problems of aviator selection; night flying; three-dimensional vision; coordination of hand and eye.

Color-blindness; improvement through vitamin feeding; handicap of color-blindness.

Errors of perception; how measured and how important.

Camouflage.

5. *Learning and the Acquisition of Skill*

Most effective methods of training men to be soldiers; factors of practice, law of "effect," creation of morale.

How to measure learning ability; verbal, motor, social.

Time and motion studies.

Training of low-grade; salvage of handicapped.

Women in industry.

"Toughening" process in training, value of.

Learning in personal and social adjustments.

The acquisition of attitudes, prejudices, etc.

6. *Emotions*

Can fear be controlled; its physiological basis; how fears are learned and how eradicated.

Does advice to "keep calm" prevent fear? Why?

Facilitating effect of anger; should soldiers be urged to hate the enemy?

Can emotional tension be measured? How?

Emotion and fatigue; second wind; leadership and emotional control.

Family disruption, influence on children's fears and anxieties.

7. *Intelligence*

Definition and measurement; intelligence tests in Army, their use, value, and limitations. Other tests.

Sex and race differences in intelligence.

Vocational selection and intelligence.

Individual differences in intelligence.

Combination of intelligence tests with other tests in selection for occupations.

8. *Personality*

How are personal qualities estimated in Army; personality resemblances and differences in officers and men.

Personality traits shaped by training and culture (Japanese).

Personality factors in the control of men; can they be developed?

Maladjustment to Army life; causes of; treatment of.

Detection of trouble-makers; personality characteristics of.

Common abnormalities; how to recognize; what factors are they related to?

Attitudes; how to measure; importance of; propaganda and.

Profile necessary for: paratrooper, divebomber, officer, first-aider, one who cares for children of working mothers.

Other topics recommended are:

9. *Child Psychology*

Delinquency caused by War.

Preparation for evacuation, bombing, blackout, etc.

Explanation of war to children.
Influence of adult war attitudes and fears on children.

10. *Psychological Problems of Women in War Activities*

Nursing, occupational and physical therapy.
Care of children.
Industry.
Farming.
Waves, Waacs, etc.
U.S.O.
Red Cross.
Civilian defense.

11. *Fields for Psychological Technicians*

Government departments.
Armed forces.
Civilian activities.

OUTLINE B. GENERAL INTRODUCTORY COURSE

1. Problems of understanding, predicting, and controlling human attitudes, opinions, and behavior.

   a. *Mainsprings of action. Roots of social behavior, and of war and peace.*

      (1) Dollard, *Frustration and Aggression*, 1939
      (2) Durbin and Bowlby, *Personal Aggressiveness and War*, 1939
      (3) Cantril, *Psychology of Social Movements*, 1941
      (4) Prescott, *Emotions and the Educative Process*, 1937
      (5) Tolman, *Drives Toward War*, 1942
      (6) Drucker, *The Future of Industrial Man*, 1942

   b. *Surveys of public opinion and attitudes*

      (1) Albig, *Public Opinion*, 1939
      (2) Gallup and Rae, *The Pulse of Democracy*, 1940
      (3) Lasswell, *Democracy through Public Opinion*, 1941
      (4) Lazersfeld and Stanton (Eds.), *Radio Research* 1941

   c. *Propaganda and rumor*

      (1) Doob, *Propaganda, its Psychology and Technique*, 1935
      (2) Freeman, *Conquering the Man on the Street*, 1940
      (3) Various, *Institute for Propaganda Analysis*
      (4) Lerner, *Ideas and Weapons*, 1939
      (5) *Safeguarding Military Information* (film), OWI, U. S. Govt.

   d. *Morale and esprit de corps; authority and leadership*

      (1) Dollard, *Victory over Fear*, 1942
      (2) Rothlisberger and Dickson, *Management and the Worker*, 1941
      (3) Watson (Ed.), *Civilian Morale*, 1942

2. Problems of effective utilization of different individual capacities

   a. *Personnel selection and placement in the military services, in civil service and in industry*

      (1) Greene, *Measurements of Human Behavior*, 1941

    (2) Pennington, Hough and Case, *Psychology of Military Leadership*, 1943

    (3) National Research Council Committee, *Psychology for the Fighting Man*, 1943 (To appear)

    (4) Viteles, *The Science of Work*, 1934

    (5) Moore and Hartmann, *Readings in Industrial Psychology*, 1931

    (6) Bell, *Youth Tell Their Story*, 1938

  b. Problems of training

    (1) Viteles, *Industrial Psychology*, 1933

    (2) McGeoch, *Psychology of Learning*, 1942

3. Problems arising out of strain: conflict, frustration, adjustment

  a. Behavior not socially acceptable

    (1) Reckless and Smith, *Juvenile Delinquency*, 1932

    (2) McKinney, *Psychology of Personal Adjustment*, 1941

    (3) Shaffer, *Psychology of Adjustment*, 1936

    (4) Davis and Dollard, *Children of Bondage*, 1941

    (5) Rogers, *Clinical Treatment of the Problem Child*, 1939

  b. Breakdowns in war-time: war neuroses

    (1) Miller et al., *Neuroses in Wartime*, 1940

4. Problems of leadership, social control, and social change

  a. How primitive societies solve their problems

    (1) Benedict, *Patterns of Culture*, 1934

    (2) Mead, *From the South Seas*, 1939

    (3) Kardiner, *The Individual and his Society*, 1939

  b. Social psychology of contemporary life

    (1) Lynd, *Middletown*, 1929; *Middletown in Transition*, 1937

    (2) Warner et al., *Social Life of a Modern Community*, 1941

    (3) Mumford, *The Culture of Cities*, 1938

    (4) Cantril, *Psychology of Social Movements*, 1941

    (5) Plant, *Personality and the Cultural Pattern*, 1937

SUGGESTED TECHNIQUES OF INSTRUCTION
APPLICABLE TO WARTIME NEEDS

1. Clipping collection, Psychology and War, assembled by students, posted and discussed.

2. Propaganda techniques gathered constantly from newspapers, radio, movies, books, etc.

3. Radio assignments of programs such as Town Hall Meeting, presenting two sides of controversial issues of psychological interest.

4. Studies of races and nations from authentic pre-war sources, revealing accomplishments, customs, and characteristics for a better understanding of post-war federation problems.

5. Regular classroom reports on wartime psychology published in the Psychological Bulletin.

6. Instructional films, including those released by the Government as part of its information service, e.g., Democracy in Action, Americans All, Men and the Sea, Women in Defense, Building a Bomber.

II. Special Training Courses for Immediate Service

Most special training courses will be given as parts of the training programs of the Army and Navy. Positions as psychological technicians in the armed forces will be filled by students assigned to these courses as part of their military training. Outside the Army and Navy programs, some courses, intended especially for women, will give training in child care, industrial personnel work, and psychological needs and facilities.

Though most special training courses will be officially designed by the Army and Navy, it is not inappropriate to make general suggestions concerning them.

The proper selection of students for training is of major importance. Those chosen should be emotionally stable, personally acceptable, intelligent young people, able to carry out orders and to work cooperatively with others. Because mature personality is a major requirement for the work, it does not seem desirable to select those just out of high school. It is suggested that the training be given only to advanced undergraduates and college graduates who possess the necessary qualifications in intelligence and personality. It is preferable that they have had training in psychology and the social sciences, including research techniques, but a high order of intelligence is more important than antecedent course work.

Training along the following lines is recommended:

1. *Statistical Methods*, with special reference to test construction, evaluation and interpretation.

2. *Standard Test Methods*, including practice in the administration of individual and group tests. Such training should include supervision in the clinical interpretation of the individual test.

3. *Other Personnel Methods*, including the use of interviews, ratings, questionnaires, attitude scales.

4. *Clinical and Abnormal Psychology*, with training in diagnosis of personality maladjustments, administration and interpretation of individual tests, remedial techniques, special training methods.

5. *Experimental Methods*, including knowledge of apparatus, use of controls, experimental design.

6. *Social Psychology*, with special reference to the socialization of the child, social motives, attitude and opinion studies, special aspects of the social situation in industry and in the Army and Navy.

7. *Vocational and Industrial Psychology*, with attention to job analysis, motion and time studies, working conditions, selection of personnel, problems of morale.

It is important that special training be given within a framework of general understanding of psychological problems. It is also important that personal fitness be determined through supervised work in which the student experiences demands upon him, closely related to those which he will find in the actual work for which he is training. The Committee believes therefore that the following principles should be followed in planning special training programs:

(1) A basic knowledge of human behavior must not be neglected in favor of methods. Without a sound background in psychology, methods will be mechanically and unintelligently applied.

(2) Basic methods should be taught rather than specific techniques useful in some one agency or service. The student must—and will—acquire his special training on the job.

(3) Classroom work should be supplemented and illustrated by actual apprenticeship, supervised work in institutions, clinics, business firms, social agencies, and the like.

III. The Training of Research Specialists

In setting up and administering a program of psychological research, whether it includes technical experimental procedures, guidance, special training, opinion survey or some other field, a small—but increasing—number of highly trained men and women is urgently needed. No formal program can be laid down by the Committee for these specialists, whose training is at the Ph.D. level. However, in the light of what is now being done by research psychologists in the military service and in civilian agencies, the Committee strongly recommends that in current training for Ph.D. degree stress be placed on experimental and other research procedures, psychometrics (including test construction), learning, personnel methods, social psychology and abnormal psychology.

Committee of the American Psychological Association
on College Curriculum Adjustments

H. B. English
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BOOK REVIEWS

HURLOCK, ELIZABETH B. Child development. New York: McGraw-Hill.
1942. Pp. xiv +478.

Hurlock's book is a college textbook in child psychology, although the
title "Child Development" may suggest a wider range of subject-matter.
While the book gives some attention to physical growth, it does not at-
tempt to cover such topics as the health, nutrition, immunology and
endocrinology of the child. The emphasis upon behavior is paramount,
and the chapter headings are the conventional topics of child psychology
texts.

There are many favorable things to be said concerning Hurlock's
text. It is soundly based upon modern experimental investigations of
child behavior, with frequent references to specific studies. The author's
accounts of these investigations are concise and clear. The book through-
out is very readable. This is due in part to the author's style, in part to
the excellent organization into topics and sub-topics, each indicated by an
appropriate heading, and in part to the numerous illustrations, charts and
tables which accompany the discussion. A notable feature of the text is
its fairly uniform coverage of the entire period from birth through adoles-
cence; most child psychology textbooks lean too heavily on the pre-
school years, and, of course, most of them do not include the adolescent
period. There are unusually full chapters on religion, on sex development
and on forms of self-expression.

The weaknesses of the book are not peculiar to it, but are shared by
most textbooks. Why do authors place alongside of perfectly good obser-
vational material a multitude of ex cathedra pronunciamentos which
have no observational support? Hurlock does this frequently: "Adoles-
cent snobbishness and rudeness are outgrowths of self-assertiveness
(243)." This is merely a hunch of the author, but how is the student to
know that it is not a well-established view? "Before the baby forms defi-
nite concepts about other people, he forms concepts about himself (389)."
How could anybody know this? "The *emotionality* of the baby between
the ages of six months and two and one-half years may be traced to the
cutting of teeth (102)." This is a very exceptional view, but the student
is not told that there is anything unusual about the doctrine. These are
not merely isolated statements. For instance, the author has a section of
several pages on adolescent stages of love (calf-love, puppy-love, romantic
love) which are completely lacking in documentation. Many of her
statements concerning adolescence are of that character. We have no
objection to the author's holding opinions on these topics, but her opin-
ions are presented to the student in a way which confuses them with fact.
Let us emphasize again that this does not occur any more often in this
book than in many others. The shame is that it occurs at all.

Some topics which usually appear in child psychology texts are omit-
ted in this book. While there is a chapter on the "Development of Under-
standing," there is no treatment of the development of intelligence,
practically no discussion of the nature-nurture question in regard to

intelligence, no reference in this regard to the studies of Wellman, of Freeman, Holzinger and Newman, of Leahy, etc. Similarly, there is little mention of gifted and retarded children. The author apparently feels that the discussion of intelligence belongs in a separate course. There is something to be said for that point of view, but whether the instructor likes it or not, students will certainly introduce questions of intelligence into the child psychology course.

The absence of a chapter on learning and on personality constitute other notable omissions. To be sure, these topics are dealt with to some extent in other sections, but many teachers would probably wish separate treatments of them.

Other topics are given a treatment incommensurate with their importance. Juvenile delinquency is taken care of in two pages; Hartshorne and May's three volumes are reduced to one page; Piaget's extensive studies are accorded three paragraphs. We appreciate the enormous task of compression which confronted the author, but the *relative* space given to these investigations should have been greater.

A very useful bibliography of about 850 titles is appended. However, the names of not more than half of the authors appear in the index and consequently, one must infer that, unless the index is incomplete, many of them are not referred to in the text.

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Louisiana State University.

CASIELLO, LUIS. El enfermo mental y su asistencia. Foreword by Alejandro Raitzen. Rosario: Librería y Editorial Ruiz, 1942. Pp. 45.

In Santa Fe Province, Argentina, as well as elsewhere in the world, an increasingly acute need for adequately extensive institutional facilities for treating the insane has become manifest. The seven brief chapters of this book constitute a layman's campaign to characterize for the responsible public a local need and the means of meeting it. His account of the nature and incidence of mental disorder is an admirably compact and lucid presentation of the relevant facts, and his grasp of the purport and methods of modern psychotherapy might be a revelation to some academic psychologists. Excellently selected statistical material is included, as well as a novel consideration of the "economics of occupational therapy."

HOWARD DAVIS SPOERL.

American International College.

BOOKS AND MATERIALS RECEIVED

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MASSERMAN, J. H. Behavior and neurosis. Chicago: University of Chicago Press, 1943. Pp. ix+269.

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ROBERTS, W. H. Psychology you can use. New York: Harcourt, Brace, 1943. Pp. 246.

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ZILBOORG, G. Mind, medicine, and man. New York: Harcourt, Brace, 1943. Pp. vi+344.

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BARBARA S. BURKS, research associate, Columbia University, died Tuesday, May 25, 1943, in New York City, at the age of forty years.

ROBERT A. BROTEMARKLE, professor of psychology and personnel officer of the college at the University of Pennsylvania, has been appointed director of the psychological laboratory and clinic and chairman of the department of psychology to succeed the late EDWIN B. TWITMYER. Dr. Brotemarkle has resigned as personnel officer, a position which he has held in conjunction with his teaching activities since 1926.

M. M. WHITE, professor of psychology and acting assistant dean, College of Arts and Sciences, University of Kentucky, has been appointed head of the department of psychology, succeeding the late J. B. MINER.

JACK W. DUNLAP, on leave from the University of Rochester, has resigned as director of research of the Committee on Selection and Training of Aircraft Pilots of the NRC and has accepted a commission as Lieutenant Commander in the Navy. He is attached to the Aviation Psychology Section of the Bureau of Medicine and Surgery and is working on problems of selection of aviation personnel.

EDGAR A. DOLL, director of the department of research at the Vineland Training School (N. J.) since 1925, has been chosen director of the Bonnie Brae Farm for Boys at Mellington (N. J.). In announcing Dr. Doll's acceptance, former Judge HARRY V. OSBORNE, chairman of the Bonnie Brae Farm Board of Managers, said: "For the past seven years Dr. Doll has served Bonnie Brae Farm as consultant psychologist, and Bonnie Brae is most fortunate in having secured his services as its permanent director. Dr. Doll and his family will live at The Farm, and it is our hope to make Bonnie Brae Farm a center of experimentation and research in its important field of service."

JOSEPH U. YARBOROUGH, professor of psychology, Southern Methodist University (Dallas, Tex.), has returned to the University after a two-year leave of absence during which he organized and established a program of merit selection for employees in the Social Security agencies in the state. Dr. Yarborough was recently elected president of the Association of Texas colleges.

HERBERT A. CARROLL, associate professor of psychology at the University of New Hampshire has been promoted to a professorship.

At the meeting of the Society of Experimental Psychologists held on April 9, 1943, at Columbia University, the Howard Crosby Warren Medal was awarded to PROFESSOR STANLEY SMITH STEVENS, of Harvard University. The citation reads: "His analysis of psychological pitch has revealed both its quantal structure and its functional relation to stimulus-frequency."

The National Research Fellowship Board in the Natural Sciences of the National Research Council has appointed HERMAN A. WITKIN (Ph.D.

in psychology, New York University, 1939), of the New School for Social Research to a fellowship for the academic year 1943–1944. The subject of Dr. Witkin's research is "The role of visual and postural factors in the determination of the constancy of the perceived vertical and horizontal."

The John Simon Guggenheim Memorial Foundation has announced the 18th annual series of awards of Guggenheim fellowships. Among the 64 awards for the year 1943–44, are to two psychologists as follows: DR. BARBARA S. BURKS, research associate in psychology, Columbia University: To gather materials for a book on the role of twins in the study of man, based on case studies of the development, life adjustment in maturity and environmental history of identical twins separated in infancy and reared apart; DR. SOLOMON E. ASCH, assistant professor of psychology, Brooklyn College: To prepare a book on the formation and change of opinion and attitude, based upon experimental investigations.

In the April 9th issue of *Science*, EDWARD A. HENRY of the University of Cincinnati, reports on the number of doctoral dissertations accepted in the various sciences for the years 1934–1942, inclusive. Psychology ranks third in the list, with a total of 1,028 doctoral dissertations for the entire period distributed by years as follows: *1934*, 104; *1935*, 101; *1936*, 118; *1937*, 112; *1938*, 108; *1939*, 123; *1940*, 120; *1941*, 117; *1942*, 125. An analysis of doctoral dissertations accepted by universities shows the replacement of the private universities by the great state universities, who now take top rank in the number of degrees granted.

On May 9, a psychology seminar was dedicated to the late JUNE E. DOWNEY jointly by the faculty of the department of psychology and philosophy, University of Wyoming, and by the University's chapter of Psi Chi, of which Dr. Downey was a charter member. RICHARD UHRBROCK, director of industrial relations, Procter and Gamble, formerly a colleague of Dr. Downey in the department, gave the commemorative address. On this occasion gifts from Dr. Downey's friends were added to the June E. Downey Library Fund.

At the March meeting of the Chicago Psychological Club, DR. HAROLD C. TAYLOR, Western Electric Company, spoke on "A Review of the Psychological Activities at the Hawthorne Plant." At the April meeting, DR. MANDEL SHERMAN, director of the Orthogenic School of the University of Chicago spoke on "The Use of Electro-Encephalograms in Experimental Studies of Emotional Frustration."

At the spring meeting of the National Academy of Sciences on April 26 and 27, LEONARD CARMICHAEL of Tufts College, and CALVIN P. STONE of Stanford University, were elected Members of the Academy, and WALTER R. MILES of Yale University was elected a Member of the Council of the Academy.

STEUART H. BRITT, recently commissioned Lieutenant D-V(S), USNR, leaves his position as Director of The Office of Psychological Personnel. The Office will continue however and communications addressed to it will receive prompt attention.